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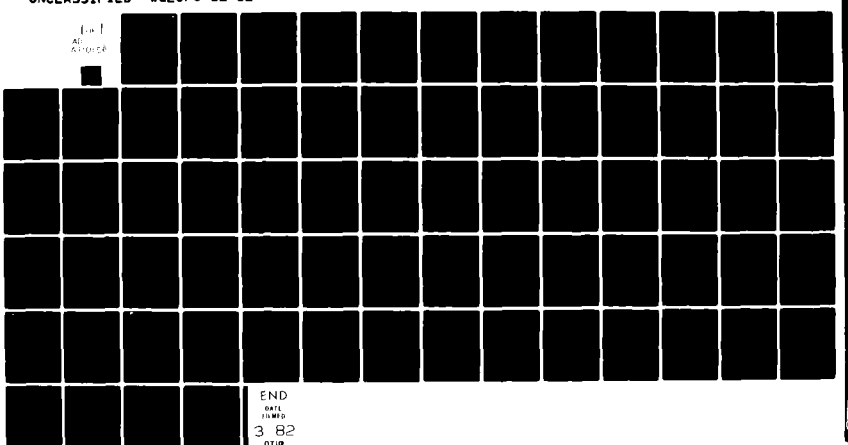

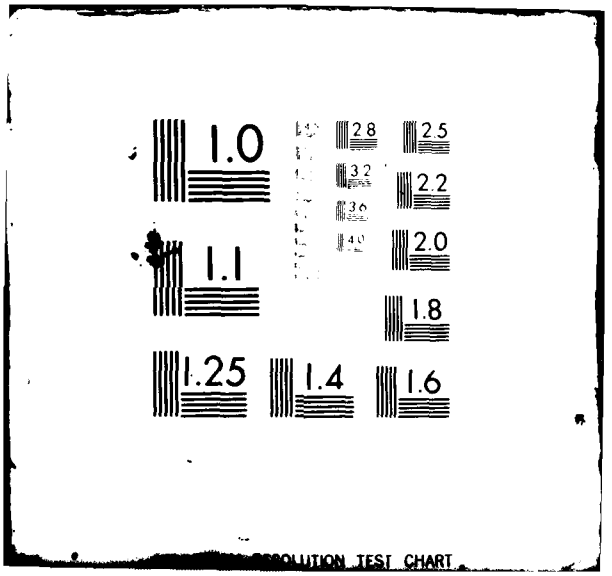
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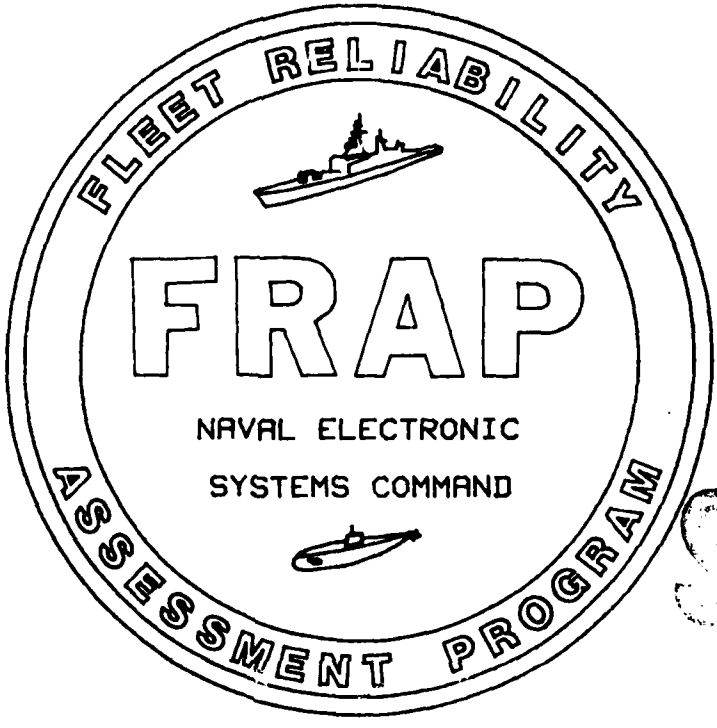

EQUIPMENT REPORT

AN/SRN-19(V)

NAVAL WEAPONS SUPPORT CENTER

CRANE, INDIANA

Published by the direction of Commander Naval Electronic Systems Command

JULY 1981

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This report presents the Fleet Reliability Assessment Program results of data collection and analysis on the AN/SRN-19(V) Satellite Navigation Set in field use.

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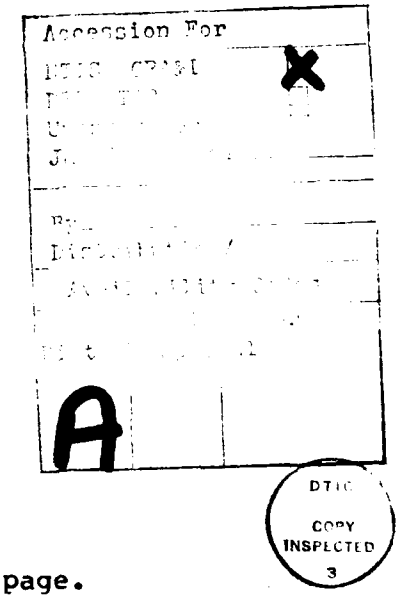

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FLEET RELIABILITY ASSESSMENT PROGRAM

DEPARTMENT OF THE NAVY

NAVAL ELECTRONICS SYSTEMS COMMAND

EQUIPMENT REPORT

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INTRODUCTION

EQUIPMENT

The AN/SRN-19(V) is an integral doppler navigation equipment that includes both a receiver and a data processer in one unit. The unit is self-contained except for the antenna, preamplifier unit, external printer, and remote display unit (readout indicator). The unit contains one receiver channel (400 MHz), data processor, 5 MHz reference oscillator, tape cassette recorder, two synchro-to-digital converters, power supply, and a front panel display. The navigation program is permanently programmed on Read-Only-Memory (ROM) chips.

The AN/SRN-19(V) has been designated V(1) for the submarine system and V(2) for the surface system. The information gained from the two systems is identical (time, latitude, and longitude), but the navigation programs differ, and the V(1) has an extended memory. This Fleet Reliability Assessment Program (FRAP) study has been concerned with only the V(2) systems installed aboard surface ships.

PRODUCTION. AMEX Systems, Inc. is the manufacturer of the AN/SRN-19(V)2 and has delivered approximately 170 systems. Deliveries are being made at the rate of approximately eight systems per month and are expected to be completed by the end of 1982.

INSTALLATIONS

At the start of the FRAP data collection period (April 1980), delivery of the AN/SRN-19(V)2 from the contractor had been underway for approximately 12 months. FRAP designated sample platforms received equipment installations primarily during the period of June 1979 through February 1980. Therefore, all platforms had relatively new installations at the beginning of the data collection period. This report describes the reported reliability, maintainability and availability performance of 19 sample platforms over the period of April 1980 through April 1981.

SECTION I: CONCLUSIONS & RECOMMENDATIONS

The AN/SRN-19(V)2 has performed well overall and has been favorably received by the majority of fleet users. Interview comments regarding accuracy, reliability, and ease of operation have been positive. Availability has been a weak spot due to the long lead times in obtaining replacement boards and modules. It is anticipated that once the RAM chip and power supply changes have been fully implemented in the equipment population and support becomes more available, reliability and availability will significantly improve. The point estimate MTBF is 3320 hours based on 54738 operating hours and 17 chargeable failures. The design goal was stated as 2000 hours mean time between corrective actions. (No estimate of field-reported maintenance time capability of the AN/SRN-19 is made because test equipment and sufficient logistic support were not available during the reporting period.)

The AN/SRN-19(V)2 appears to be very cost effective, having been designed as a low cost substitute for the much more expensive WRN-5. Due to the advent of microprocessor technology, the equipment cost is only about $25K each in quantity.

Recommendations.

1. It is recommended that the (TT-738) printer failures and intermittent stoppages due to over heating be investigated at a NAVELEX field activity.

2. It is recommended that potential causes of the intermittent display drop out requiring a system re-initialization be investigated at a NAVELEX field activity.

3. It is recommended that more adequate central supply stores and communication paths between MOTUs and users be improved in order to avoid extremely long down times.

4. It is recommended that the ten earliest available sets of test equipment be collocated physically with part sets at platform high density locations. This may require some management coordination between NAVELEXSYSCOM, MOTU and Naval Supply organizations.

SECTION II: AN/SRN-19 SYSTEM DESCRIPTION

2-1. MISSION DESCRIPTION

2-1.1 The AN/SRN-19(V) Radio Navigation Set was designed and developed beginning in 1971 by the Applied Physics Laboratory of John Hopkins University as a low-cost receiver-processor to be used in conjunction with the Transit Navy Navigation Satellite System (NNSS). It receives satellite signals, derives satellite position information and doppler counts from the satellite signals. The set provides continuous dead reckoning (DR) navigation position information updated by satellite fixes.

2-1.2 The NNSS depicted in Figure 2-1 is a worldwide, all-weather navigation system consisting of:

-Satellites in polar orbits

-Tracking stations

-Injection stations

-Data processing center

-Shipboard navigation equipment such as the AN/SRN-19(V)

The NNSS has been operational since 1964.

2-1.2 The AN/SRN-19(V) is a worldwide, all-weather, automatic shipboard navigation system. The shipboard system is a single channel (400 MHz) radio navigation receiver that provides a continuous display of ship position by dead reckoning (DR) on ship speed and heading. The DR position is periodically corrected by satellite fixes. The time between fixes depends on the user's latitude, number of satellites, and constellation configuration. With five satellites in orbit, mean time between fixes nominally varies from 100 minutes at the equator to about 30 minutes at 70 degrees latitude. Fixes are computed from measured doppler shift of the transmitted signal and orbit data that is continuously broadcast by each satellite. The AN/SRN-19(V) automatically provides a visual display of time, latitude, and longitude that is refreshed every five seconds. The navigation system requires that keyboard entries be used for entering initializing data; thereafter, the system operates automatically. Specifically, the navigation set performs the following functions:

a. After each satellite pass, computes and displays present location of the ship at a nominal sea accuracy of 0.25 mile.

b. Dead reckons between satellite fixes.

c. Computes and displays the great circle range and bearing from the present position to any location.

d. Computes and displays the next expected rise time and elevation at closest approach of the previously tracked satellite.

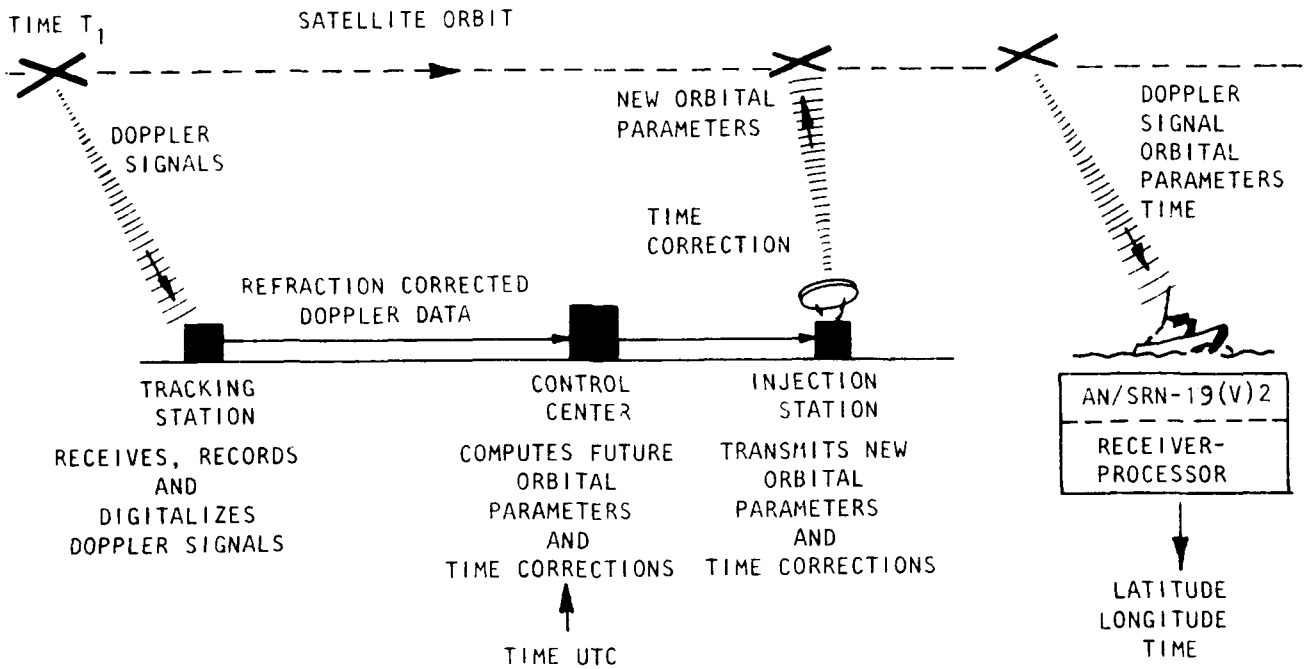

Figure 2-1. Navy Navigation Satellite System

e. Displays UTC accurate to one second (in five second increments).

f. Displays speed and heading input.

g. Displays set and drift input.

h. Displays data on tracked satellite.

i. Self-tests itself and displays fault location should a failure occur.

2-1.3 Transit is the only navigation satellite system available today which provides truly worldwide coverage. This situation will continue until at least 1987, or later, when NAVSTAR, the Global Positioning System, is expected to become operational. A ten year overlap period from the time NAVSTAR becomes operational will allow users to depreciate Transit equipment before having to purchase NAVSTAR equipment. It is therefore anticipated that Transit will continue to provide service until at least 1997.

2-2 EQUIPMENT DESCRIPTION

2-2.1 The AN/SRN-19(V)2 Radio Navigation Set (Figure 2-2) consists of four major components:

	NAME	NOMENCLATURE
1.	Antenna Group:	OE-284/SRN-19(V)
	Antenna	AS-3330/SRN-19(V)
	RF Amplifier	AM-7010/SRN-19(V)
2.	Receiver-Processor	R-2135/SRN-19(V)
3.	Readout Indicator	ID-2182/SRN-19(V)
4.	Teleprinter	TT-738/SRN-19(V)

A simplified block diagram of the radio navigation set is provided in Figure 2-3.

2-2.2 Antenna Group OE-284/SRN-19(V). The antenna group consists of Antenna AS-3330/SRN-19(V) and RF Amplifier AM-7010/SRN-19(V).

2-2.2.1 Antenna AS-3330/SRN-19(V). The antenna is a linear polarized whip type with ground plane which receives the RF signals transmitted by the satellite. The whip is housed in a fiberglass dome and is essentially omni-directional in its horizontal radiation pattern, and the vertical patterns vary approximately 11 dB from 10^{o} to 70^{o} above the horizontal plane.

2-2.2.2 RF Amplifier AM-7010/SRN-19(V). The RF amplifier provides initial amplification of the 400 MHz satellite signals and determines the noise figure for the system. The satellite signals are then connected via RF coaxial cable to the receiver for further amplification and processing. A +12 VDC is supplied to the amplifier from the receiver-processor via the center conductor of the RF coaxial cable.

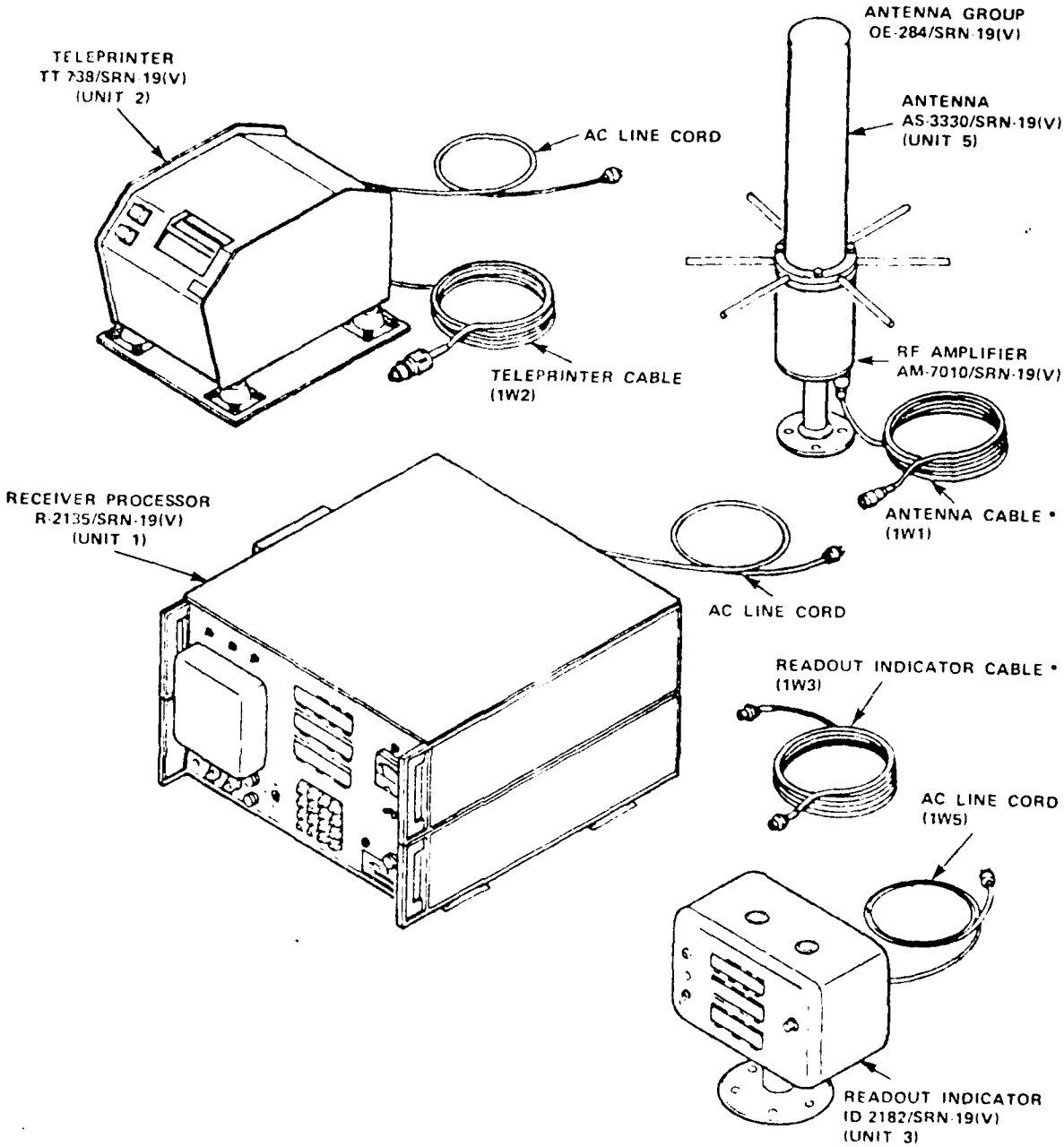

Figure 2-2. AN/SRN-19(V)2 Radio Navigation Set

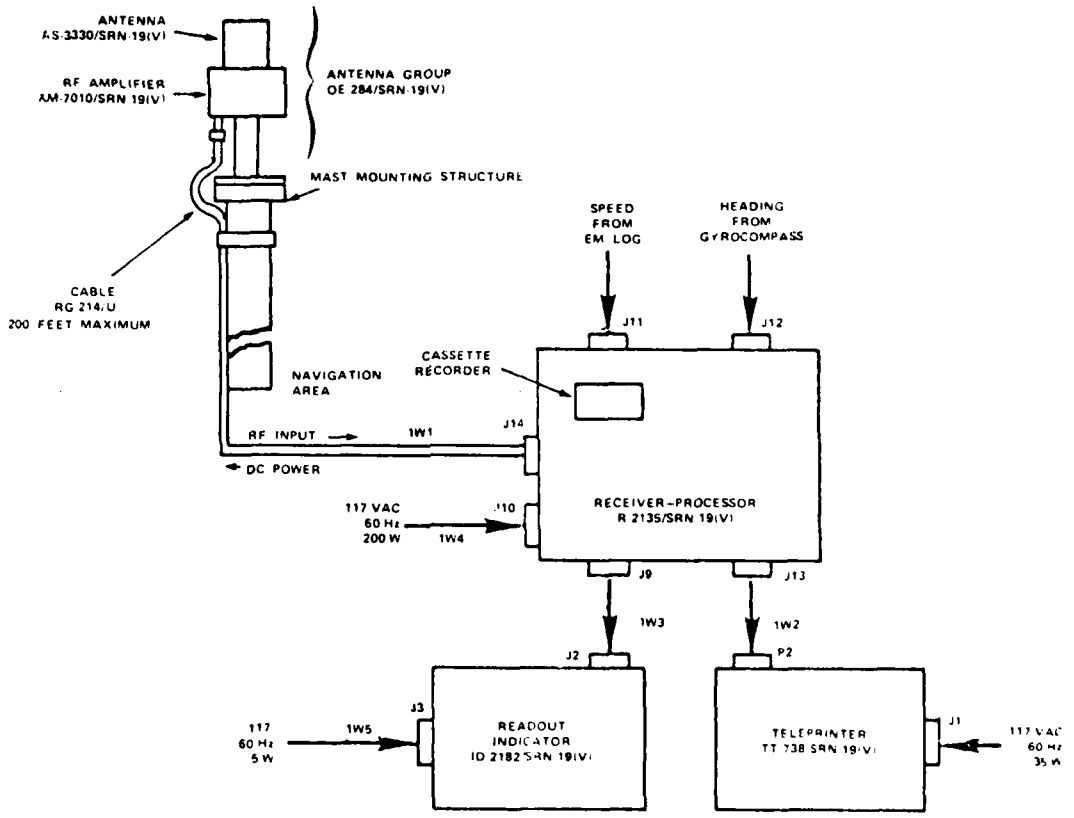

Figure 2-3. AN/SRN-19(V)2 Interconnecting Diagram

2-2.3 Receiver-Processor R-2135/SRN-19(V). The receiver-processor contains the electronics to process data input from the RF antenna, ship EM log, gyrocompass, and receiver-processor keyboard. The receiver-processor then performs the navigational computations and provides required output. Output consist of visual display at the front panel, formatted data to the readout indicator, teleprinter, and tape cassette recorder. The receiver-processor may be divided into the following functional groups: receiver, synchro-to-digital converters (S/D), front panel keyboard, data processor, front panel display, data recovery (cassette recorder), and power supply. A functional diagram of the receiver-processor is shown in Figure 2-4.

2-2.3.1 Receiver. The receiver group amplifies and processes the satellite signal. The manual and automatic frequency search and track circuits are contained in this group. The receiver will sweep frequency continuously until a satellite signal is received. When the signal is received, the receiver locks on and tracks the signal as the frequency varies due to the changing doppler during the satellite pass. Once the receiver locks onto the satellite's 400 MHz signal, two types of information are extracted. One is the reconstructed doppler shift of the satellite signal which results from the relative motion between the navigator and the satellite transmitting the signal. The other type of information is obtained by demodulation of the satellite carrier which is phase modulated with a message describing the satellite position in inertial space. This data, along with the information on ship's motion during the satellite pass, is used by the navigation program to compute the ship's position.

2-2.3.2 Synchro-to-Digital (S/D) Converter

The synchro-to-digital converters receive ship heading and speed in synchro format and convert them to digital format for input to the data processing circuits. The heading and speed converters are identical.

2-2.3.3 Data Processing Circuits. The data processor accepts input from the receiver, ship's EM log, ship's gyrocompass, and operator keyboard entries. The data processor consists of read only memory board 1 (1A15), remote display driver board 2 (1A2), RF decoder board 3 (1A3), display interface and RAM display board 4 (1A4), TTY and multiplexer board 5 (1A5), I/O interface board 6 (1A6), and microprocessor board 7 (1A14). The microprocessor board is a National Semiconductor IMP-16C 200 16-bit parallel processor on a 9 by 11 printed wiring card. The read only memory board contains the 8192 by 16 bit navigation program. The program memory consists of eight custom masked IC ROM's, each organized as 2048 by 8 bits/word. The current program is the MK-4 version developed by the Applied Physics Lab. A new MK-7 version with extended memory is planned for implementation in the near future. Appendix B contains the final report on the MK VII Program Test and Evaluation by NESEA.

2-2.3.3.1 Dead Reckoning Program. The navigation program updates present latitude and longitude once per second by dead reckoning on ship's true speed and heading. The ship's position on the front panel display is refreshed every five seconds. True speed and heading are obtained by summing vectorially the speed and heading of the ship with respect to the water with the set and depth of the current in the area. The heading and speed of the ship with respect to the water are obtained automatically from the ship's MK 19 Gyrocompass and

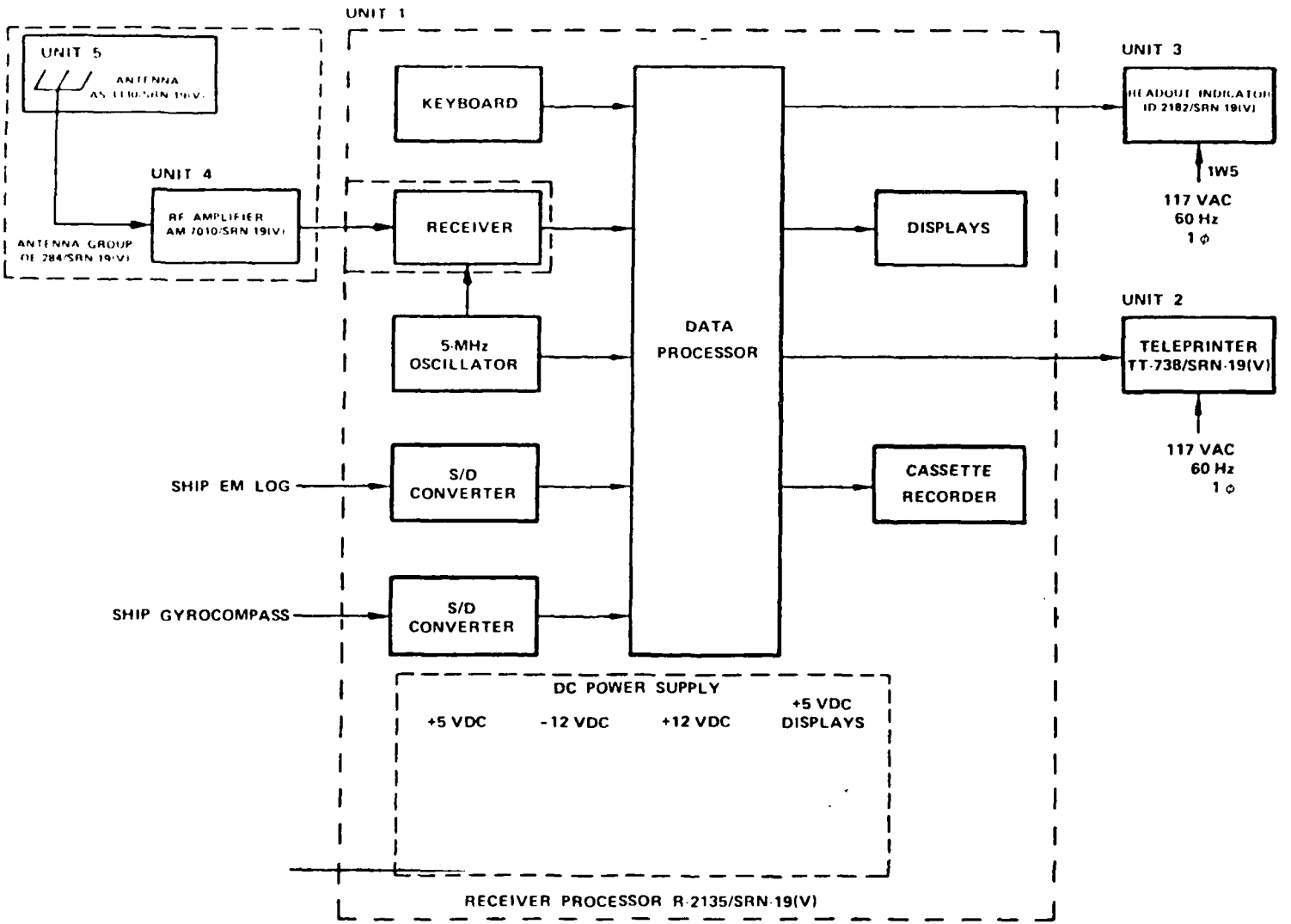

Figure 2-4. AN/SRN-19(V)2 Functional Block Diagram

electromagnetic underwater log through the AN/SRN-19(V) synchro-to-digital converters. The dead reckoning program continues to run once per second regardless of any other programs that may be executing (i.e., great circle program, satellite fix program, or alert program).

2-2.3.3.2 Satellite Fix Program. When the receiver locks onto a satellite signal, the program recognizes the beginning of a 2-minute data transmission interval, collects and majority votes the satellite message data, and computes a satellite fix provided there is sufficient satellite data.

2-2.3.4 5 MHz Oscillator. The 5 MHz reference oscillator is used to provide an extremely stable reference frequency for the receiver and the basic timing frequency for the processor. The reference oscillator uses an Austron model 1120 Quartz Crystal oscillator. The inherent stability of the crystal oscillator is further enhanced by operating the crystal and temperature sensitive components of the oscillator in a temperature controlled oven. If power is removed from the system, a minimum of one hour is required for the oscillator to stabilize and for the system to achieve its nominal accuracy.

2-2.3.5 Display. The front panel display is a 7-segment Light Emitting Diode (LED) device that reads out any one of 23 data entry modes or 15 data display modes selectable at the front panel keyboard.

2-2.3.6 Cassette Recorder. Data recovery consists of a record-only cassette. If desired and selected by the operator, data is recorded each time a display mode is selected.

2-2.3.7 Power Supply. The receiver-processor has been modified to contain a single power supply that develops the required dc voltages from the 115 vac, 1 phase, 60 Hz primary power. The original configuration consisted of four separate power supplies.

2-3 Readout Indicator ID-2182/SRN-19(V). The readout indicator provides an identical readout of the data displayed on the front panel of the receiver-processor. Locted on the front panel in addition to the readouts is a power switch, indicator light, fuse, and readout intensity control. Data is displayed by three rows of eight LED 7-segment readouts on the display board. The display board contains the display devices and associated drivers, and decoding circuitry.

2-4 Teleprinter TT-738/SRN-19(V). The teleprinter is an Anadex DP-752 Teleprinter that accepts serial ASCII, asynchronous input data at 10 characters per second. This unit provides a permanent record of displayed data. A printout on "roll paper" occurs each time a display mode is selected.

SECTION III - RELIABILITY REQUIREMENTS

3-1 DESIGN RELIABILITY

The Applied Physics Laboratory of Johns Hopkins University designed the AN/SRN-19(V)2 as a low-cost, simple, and reliable satellite navigation set, with the primary tradeoff being system accuracy. However, during the design phase there were no formal requirements for equipment MTBF, reliability modeling, or reliability prediction.

3-2 GOAL

The design goal as stated in the Integrated Logistic Support Plan is 2000 hours MTBCA (Mean Time Between Correction Actions). The initial MTBCA as determined from the MDCS (Maintenance Data Collection System) was 3000 hours. The FRAP reliability results are discussed in Section VII of this report.

SECTION IV - MAINTENANCE CONCEPT

4-1 MAINTAINABILITY

The maintenance concept for the AN/SRN-19(V) radio navigation set utilizes a combination of system status checks, diagnostic fault isolation, and replacement of the subassembly/printed circuit boards to effect any needed repairs. The radio navigation set can be fault isolated by using a combination of the limited BIT (Built-In-Test) features, standard troubleshooting procedures, and a special "Fault Isolation Test Set" developed by Applied Physics Laboratory. The AN/SRN-19(V) is designed to a wire wrap printed circuit card and module concept and permits rapid repair by replacement of defective cards/modules.

4-1.1 Organizational Level Corrective Maintenance

Shipboard maintenance of the AN/SRN-19(V) is accomplished at the module level. Printed circuit boards/modules are not repairable at the O-level. Maintenance personnel perform corrective maintenance through fault isolation using the BIT, General Purpose Electronic Test Equipment (GPETE), Special Purpose Electronic Test Equipment (SPETE) and replacment of modular assemblies. Some discrete, chassis- mounted components, or other specified piece parts not mounted on modules are replaceable. Ships are not currently authorized by the APL (Allowance Parts List) to carry spare boards.

4-1.2 Depot Level Corrective Maintenance

A Navy depot repair facility is being established at NAVELEXSYSENGCEN San Diego for the repair of defective 4G cognizance items and is expected to become operational by August 1981. Interim depot repairs are being accomplished by AMEX Systems, Inc., Hawthorne, California. Table 4-1 identifies the depot repairable 4G assemblies. NAVELEXSYSENGCEN San Diego is designated the Technical Repair Agent for the equipment, and has the responsibility for repair management of 4G cognizance items.

4-2 FAULT ISOLATION TEST SET

The Applied Physics Laboratory has completed development and testing of a Fault Isolation Test Set and will begin distributing ten test sets to various Navy activities. The maintenance philosophy will be to use the Fault Isolation Test Set to isolate failed modules and have the ship return those modules to the depot or MOTU for replacement modules.

TABLE 4-1
DEPOT REPAIRABLES

PART NUMBER	REFERENCE DESIGNATION	NOMENCLATURE	NATIONAL STOCK NUMBER
7240-0072	1A13	Signal Data Cassette Recorder	4G-5825-01-068-0732
908	1A13A3	Card - Formatter	4G-5825-01-068-4341
911	1A13A2	Card - Write Step	4G-5825-01-068-4342
945DLM	1A13A4	Load Forward	4G-5825-01-068-4343
7240-0104	2	Teleprinter	4G-5825-01-067-3272
7240-0080-09	1A12/3A1	Circuit Card Assembly	4G-5825-01-068-0696
7240-1000	1A7	Receiver Assembly	4G-5825-01-067-3210
7240-0138	1A15	Circuit Card Assembly	4G-5825-01-068-0704
7240-0085	1A2	Circuit Card Assembly	4G-5825-01-068-0702
7240-0053-01	1A4	Circuit Card Assembly	4G-5825-01-068-0699
7240-0052-01	1A3	Circuit Card Assembly	4G-5825-01-068-0694
7240-0055-01	1A6	Circuit Card Assembly	4G-5825-01-069-2474
7240-0084-01	1A14	Circuit Card Assembly	4G-5825-01-068-0697
7240-0070	1A11	Circuit Card Assembly	4G-5825-01-068-0701
7240-0054-01	1A5	Circuit Card Assembly	4G-5825-01-068-0700
7240-0013-01	1A9	Radio Oscillator	4G-5825-01-068-0674
105-77-03-007-01	1A17	Keyboard	4G-5825-01-068-4340
7240-0118-1	3A2	Circuit Card Assembly	4G-5825-01-068-0703

SECTION V - EQUIPMENT PROBLEMS/CORRECTIVE ACTION

5-1 HISTORY

The AN/SRN-19(v)2 has performed satisfactorily since its introduction into the fleet in 1979. Several early failure trends were identified by the Applied Physics Laboratory and analyzed. Based on the percentage of failures, the two major problems were the power supply system and the RAM (Random Access Memory) chips installed on the 1A4 display board (Board 4).

5-1.1 Power Supply Failures

The AN/SRN-19(V)2 was originally designed with four separate power supplies consisting of two five volt power supplies, one plus twelve volt power supply, and one minus twelve volt power supply furnished by three different manufacturers. The power supplies have been a constant source of failure and it was originally thought that insufficient air circulation was the cause since temperature dots were turning black. One power supply in particular had a very high failure rate. This was brought to the attention of the manufacturer who studied the problem but concluded that the air flow was actually sufficient since the ambient temperature around the power supplies was only about 30°C. Tests at APL with the same power supply mounted on work benches with adequate ventilation also resulted in failures for no apparent reason. It is suspected that the failures were a result of poor workmanship and an inefficient design for heat dissipation. The power supply manufacturer was reportedly uncooperative in resolving the cause of failure and refused to take corrective action. For this reason, APL decided to redesign the power supply system and selected a new single power supply. The new power system is a KEPKO RMT-001-AA-20958 and provides +5, +12, and -12 VDC.

5-1.2 RAM Failures

A second major problem involved the high failure rates of the plastic packaged RAM chips on the 1A4 display board. APL has concluded that the chip manufacturing process introduced contaminants into the chip and that after a period of time on the shelf or in the field, the contaminants caused degradation of the bonding connections and the internal functions of the random access memory. It appears that a combination of the plastic packaging and the process by which the chip was manufactured caused the contamination. APL has decided to switch to an N-channel type chip with a different fabrication process whereby the plastic packaging and the chip materials are compatible.

5-1.3 Recorder Microswitch

A microswitch was added to the cassette recorder so that it would only operate with a cassette installed. This change was made as a precaution against possible future failures in this area.

5-2 CORRECTIVE ACTIONS

The above engineering changes are being incorporated by the equipment manufacturer, AMEX Systems, in equipment serial numbers 150 and above. AMEX is preparing to undertake a second reliability demonstration using the new

configuration. NAVELEXSYSENGACT St. Inigoes and NAVELEXSYSENGCEN San Diego are in the process of planning to retrofit earlier systems. It is interesting to note that the FRAP sample equipments did not possess the engineering changes and yet still exceeded the reliability goal of 2000 hours MTBCA.

5-3 SOFTWARE

No software problems were reported for the AN/SRN-19(V)2.

SECTION VI - FLEET DATA COLLECTION/SAMPLE PLATFORMS

6-1 DATA COLLECTION

During the AN/SRN-19(V)2 data collection period, failure data was reported on OPNAV 4790/2K (2-KILO) Ship's Maintenance Action Forms by participating FRAP platforms. Nineteen sample equipments were initialized by FRAP teams between the months of April and July 1980. Following is the list of participating platforms:

Atlantic Fleet	Pacific Fleet
USS CHARLES F. ADAMS	USS DOWNES
USS AINSWORTH	USS GRAY
USS DONALD B. BEARY	USS OUELLET
USS CONNOLE	USS SHIELDS
USS GARCIA	USS TOWERS
USS THOMAS C. HART	USS WHIPPLE
USS JOSEPH HEWES	USS HOEL
USS EDWARD MCDONNELL	
USS MILLER	
USS PAUL	
USS PHARRIS	
USS VALDEZ	

6-2 ELAPSED TIME METER INSTALLATION

Because the AN/SRN-19 does not possess an Elapsed Time Meter (ETM), it was necessary for FRAP representatives to install meters in all of the sample equipments. The ETM meter installation is shown in Figure 6-1.

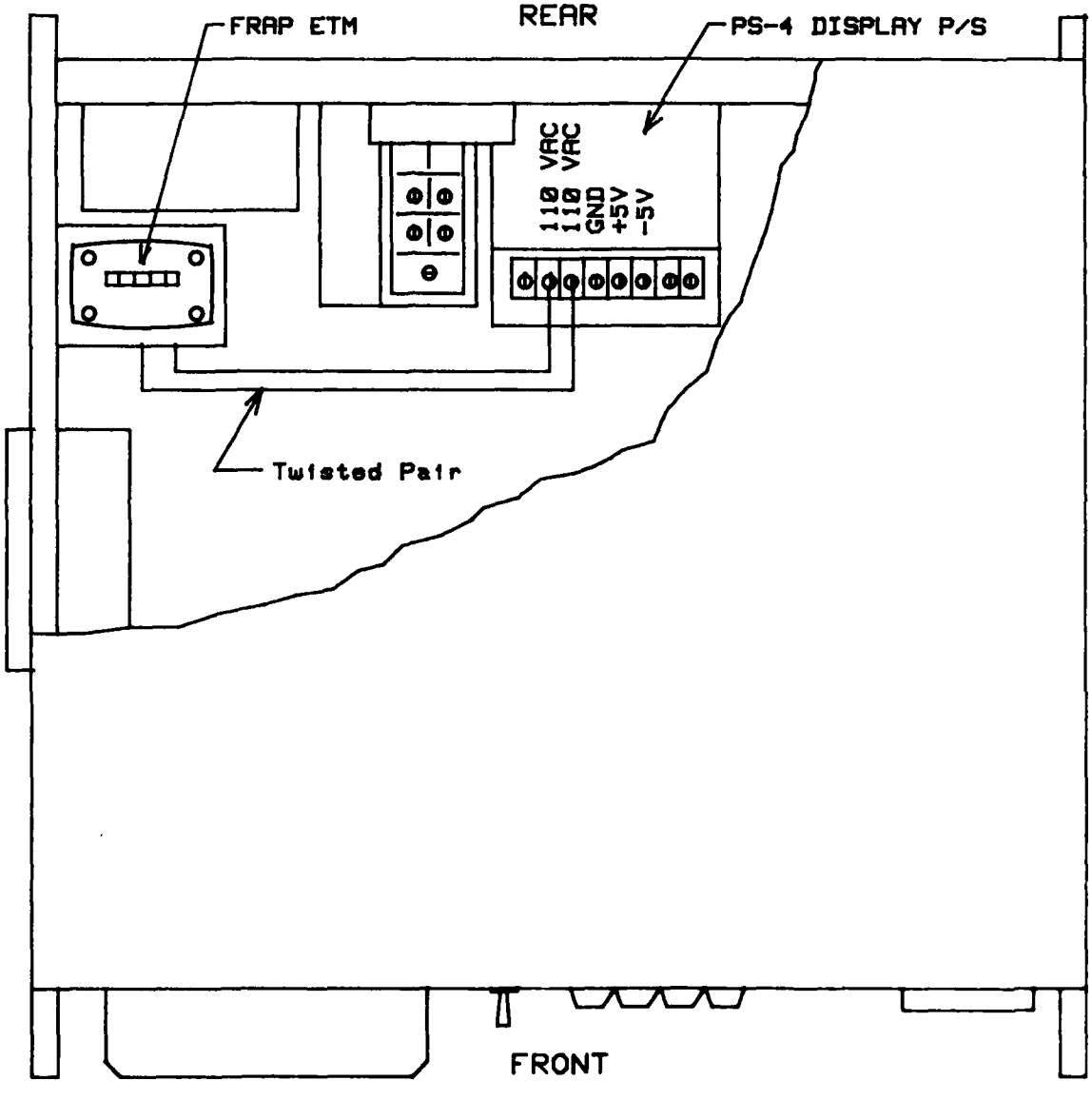

FIGURE 6-1
FRAP Elapsed Time Meter Installation

SECTION VII - ANALYSES

7-1 OBSERVED FAILURES. Failures or user problems were reported by the USS WHIPPLE: USS ADAMS: USS AINSWORTH; USS GARCIA; USS GRAY; USS TOWERS; USS HEWES; USS MCDONNELL; USS MARVIN SHIELDS; USS DOWNES; USS BEARY; USS VALDEZ and the USS OUELLET. Some maintenance actions resulted in multiple replacements and in some cases the causes of failure had not been identified by the time of this report. All FRAP reports received at NAVWPNSUPPCEN Crane as of 22 May 1981 were included in the report. CASREPTS from January 1980 through March 1981 were checked to collect any additional failures.

O-level items with no reported failures can be estimated at having a failure rate of 14.7×10^{-6}. This is based on a 60% chi square confidence with 62129 operating hours. Reliability oriented corrective action is in process for the 1A4 Random Access Memories and for the power supplies. It is recommended that action be taken to investigate the intermittent dropout described by the Towers, Hewes and McDonnell; the printer failures and intermittent operation under high temperature or humidity conditions.

7-1.1 USS ADAMS. The USS ADAMS was initialized by FRAP personnel on Julian Date 80155. Letter DDG2/03:drg 3000 Ser 80 provided termination information. The TT-738 was reported inoperative due to a defective display power supply board, 3PS1, which has been on order since 3 March 1981. SYNC Card, 1A11, failed requiring the ship to manually update speed changes as they occur. The SYNC card has been on order since 2 January 1981.

7-1.2 USS AINSWORTH. The USS AINSWORTH reported a problem with the speed and bearing input cables and connectors which were causing erroneous tracking readings. The Ships Intermediate Maintenance Activity (SIMA) at Norfolk assisted the ship in rewiring the speed and bearing connectors to correct wiring errors. The USS AINSWORTH also reported a long history of board failures prior to the FRAP reporting period. Since installation, the SRN-19(V)2 has had two 1A4 board failures, two 1A8 failures, one 1A9 failure, and one 1A7 failure. During the FRAP reporting period the SRN-19 was reported as replaced three times. In addition, a 1A4, 1A7, 1A5 and a power supply were replaced. A display and printer were also reported down. This results in an estimate of ten replacements and a minimum of six separate corrective maintenance periods or actions. The FRAP reporting from this platform was not continuous; therefore, the reported time line describing the sequence of events is a best estimate of that which occurred.

7-1.3 USS BEARY. The USS BEARY reported the printer connected to AN/SRN-19, S/N C-025 overheated and would not function for a period of six hours. The printer performed satisfactorily after cooling down. The Serial number of the printer was C013. No other failures were reported.

7-1.4 USS CONNOLE. The USS CONNOLE reported via fonecon that no problems occurred during the FRAP reporting period.

7-1.5 USS DOWNES. The USS DOWNES reported verbally during a ship visit by FRAP personnel that the printer stopped intermittently under tropic humidity conditions. A sister ship, the USS BADGER reported having a similar anomaly.

7-1.6 USS GARCIA. The USS GARCIA reported two cases of display failure. In both cases, ship's force restored equipment operation by removing circuit boards and cleaning the contacts. The ship reported two maintenance actions and no parts replaced.

7-1.7 USS GRAY. The USS GRAY experienced a failure of the 1A7 receiver assembly. The assembly was replaced and equipment operation restored. On Julian Date 81077, the USS GRAY reported the processor inoperative and the printer down. The "display window" did not illuminate and the CPU Test indicator was always illuminated. A later report dated 81118 reported insufficient power from the +5 volt supply, which was replaced.

7-1-8. USS HART. The USS HART reported no problems during the FRAP reporting period. Three failure-free-time reports were received.

7-1.9 USS HEWES. The USS HEWES reported a problem with the display data dropout. Recovery required re-initializing the system. Additionally, the remote printer is "broken", and the Hewes has not been able to fix the printer nor obtain a replacement.

7-1-10 USS HOEL. The USS HOEL reported no problems during the FRAP reporting period.

7-1.11 USS MCDONNELL. The USS MCDONNELL reported an intermittent tracking dropout. The symptoms were no DDR and no R.F. lock. At the same time, there was no audio on the headset. The standard static used to check operability was not present. Recovery was accomplished by shutting the AN/SRN-19 down and re-initializing. Additionally, RAM failures were reported and corrrected by MOTU 12, Mayport, Florida.

7-1.12 USS MILLER. The USS MILLER reported no problems during the FRAP reporting period. Six failure-free-time reports were received.

7-1.13 USS OUELLET. The USS OUELLET experienced a failure of the 1A4 RAM display board. A failed RAM chip was isolated and replaced, and the equipment operation restored.

7-1.14 USS PAUL. The USS PAUL reported no problems during the FRAP reporting period. Three failure-free-time reports were received.

7-1.15 USS PHARRIS. The USS PHARRIS reported during a ship visit that a radial of the antenna was broken by accident and repaired by the ship's own resources.

7-1.16 USS MARVIN SHIELDS. The USS MARVIN SHEILDS reported that while in West PAC a RAM chip, 1101, was replaced on the A-4 board.

7-1.17 USS TOWERS. The USS TOWERS reported no major problems since installation. The unit runs rather hot so the air filter is cleaned frequently. The printer failed and was returned to NAVELEX San Diego for

repair. Date of failure was 27 Nov 80. Intermittent dropout requiring re-initializing occurred similar to that reported by the USS McDONNELL.

7-1.19 USS VALDEZ. The USS VALDEZ reported replacements of 1A4, 1A14 and 1A15 cards during the FRAP reporting period. This is interpreted as one maintenance action reported.

7-2 FAILURE CLASSIFICATION FOR RELIABILITY DATA

Reported problems were classified utilizing DOD INSTR 5000.40 of 8 July 1980 as a guide. Table 7-1 is a reliability data classification summary for the AN/SRN-19. Planners at various levels need to know how much manpower is required to support a system at depot, intermediate and organizational levels. Supply planners need to estimate the expected demands for parts. Reliability planners need to be able to estimate how well the system will perform during a mission. Quite often a one-to-one correspondence between MTBF and each occurrence of these incidents is assumed in early planning stages. DOD INSTR 5000.40 provides guidance on observing and handling field and Fleet data in order to relate to manning, mission criticality, supply, and whether a failure is chargeable to the equipment MTBF. The result is essentially a four bit code that can be used to mask various maintenance actions. Each report was classified as follows.

a. A meter reading update or a corrective maintenance action or a problem report.

b. Each corrective maintenance action or problem report is classified as critical or not critical. That is, whether the AN/SRN-19 is functional or not. The reliability block diagram and user reports are the main guidelines for the criticality judgement.

c. Each corrective maintenance action is classified as to whether a supply action is likely to be necessary or was necessary in order to effect recovery.

d. Each corrective maintenance action was classified as to whether the failure was considered chargeable to the equipment reliability using definitions of relevancy contained in MIL-STD-781 as a guide. Generally, a failure is considered chargeable to the equipment unless the user indicates an environmental failure, or through other knowledge, the analyst indicates the failures not chargeable. The term "chargeable" is similar to the MIL-STD-781 definition of a "relevant" failure. The terms relevant or nonrelevant are avoided since a failure can be very relevant to the user but not chargeable to the equipment. Examples are interface problems between ships power and equipment, electromagnetic interference, or susceptibility to damage by the location and mounting. Corrective action should be taken on serious nonchargeable failures if users consider the problem relevant to the mission. Separation of the concept of chargeable and critical as it relates to the mission is considered an area where confusion between analysts occurs.

7-2.1 USS ADAMS. The two failures reported by the USS ADAMS are classified as follows:

a. Both failures require maintenance work to accomplish (M).

b. Both failures are considered non-critical because the user indicated the system was still functional, even though one printer is down and speed changes are entered manually (X).

c. A supply action is required to correct each failure (S).

d. Both failures are considered chargeable to AN/SRN-19 unreliablity (CH).

e. This is summarized as two failures classified MXS-CH.

7-2.2 USS AINSWORTH. The USS AINSWORTH experienced many more failures than any other reporting platform. In addition, prior to FRAP, installation problems were corrected. Given the performance of other AN/SRN-19 units and the fact that the AN/SRN-19 was replaced three times, the author suspects an installation problem is still a factor in the high replacement rate. Therefore, the failures aboard the AINSWORTH are classified as follows.

a. Parts 1A4, 1A7, 1A5 and two AN/SRN-19 replacements plus the wiring change.

(1) A maintenance action is required for correction (M).

(2) The failures were considered critical to user operation (C).

(3) A supply action was required to correct the failures (S).

(4) The failures were not considered chargeable for the above stated reason (X).

(5) The failures are classified MCS-X.

b. The display and printer failures were classified as follows.

(1) A maintenance action is required to correct the display (M).

(2) A failure of the display while the printer is down is considered critical (C).

(3) A supply action is required for correction (S).

(4) The failure is not considered chargeable (X).

(5) The display failure is classified MCS-X.

c. Printer

(1) The correction of the printer requires maintenance time (M).

(2) The failure of the printer alone would not be a critical failure (X).

(3) The supply action is required to correct the printer (S).

(4) The failure is not considered chargeable to AN/SRN-19 in reliability because of the reasons stated above (X).

(5) The classification is coded MXS-X.

7-2.3 The USS BEARY Printer failure is classified as follows.

a. The failure apparently caused a maintenance investigation (M).

b. The failure is not critical because outputs are available on the display (X).

c. The correction of the failure did not require a supply action (X).

d. The failure is considered chargeable to AN/SRN-19 unreliability (CH).

e. The classification is coded MXX-CH.

7-2.4 The USS DOWNS printer failure is classified the same as the USS BEARY report for the same reasons.

7-2.5 The USS GARCIA reports of display failure are classified as follows.

a. A maintenance action was required to correct the reported deficiency (M).

b. The failure was not considered critical because the printer allows an alternate output (X).

c. No supply action was required for correction (X).

d. The failure is considered chargeable to AN/SRN-19 unreliability (CH).

e. Therefore the two incidents are coded MXX-CH.

7-2.6 The USS GRAY reported failures are classified as follows.

a. <u>1A7 Board</u>

(1) A maintenance action is required to correct the failure (M).

(2) The 1A7 board failure was considered critical to AN/SRN-19 operation (C).

(3) The failure required a supply action for recovery (S).

(4) The failure is considered chargeable to AN/SRN-19 unreliability (CH).

(5) Therefore, the action is coded MCS-CH.

b. Processor and Printer. The processor and printer failure is classified as follows. Two reports are interpreted as one maintenance action.

(1) A maintenance action is required (M).

(2) The failure is considered critical in that the AN/SRN-19 was reported down (C).

(3) The action most likely requires both a technical assist and parts (S).

(4) The failure is considered chargable to AN/SRN-19 unreliability (CH).

(5) Therefore the incident is coded MCS-CH.

c. +5 Volt Power Supply. The power supply failure is classified as follows.

(1) A maintenance action is required for correction (M).

(2) The failure is considered as causing AN/SRN-19 non-operation (C).

(3) The failure requires a supply action for replacements (S).

(4) The failure is considered chargable to the AN/SRN-19 unreliability (CH).

(5) Therefore, the failure is coded MCS-CH.

7-2.7 The USS HEWES reports are classified as follows.

a. The display failures require re-initialization which is considered a form of corrective maintenance (M).

b. The failure of the display is considered critical even though the action required to restore operation requires little time when the printer is down (C).

c. The recovery mode does not require a supply action (X).

d. The failure is considered chargable to AN/SRN-19 unreliability (CH).

e. The failure can be coded MCX-CH.

7-2.8 USS McDONNELL reported failures are classified as follows.

a. Intermittent Display

(1) The intermittent display caused a need for re-intialization which is considered a corrective maintenance (M).

(2) The failure was not considered critical because the printer is still available (X).

(3) The recovery does not require supply action (X).

(4) The failure is considered chargeable to AN/SRN-19 unreliability (CH).

(5) Therefore, the failure can be coded MXX-CH.

b. RAM Failures

(1) The failure of the 1A4 RAM's required maintenance effort to correct (M).

(2) The failure of the 1A4 is considered critical to AN/SRN-19 operation (C).

(3) A supply action is required to obtain replacements (S).

(4) The failure is considered chargeable to AN/SRN-19 unreliability (CH).

(5) The incident is therefore coded MCS-CH.

7-2.9 The USS OUELETT RAM failure is classified the same as the McDONNELL RAM failures for the same reasons.

7-2.10 THE USS PHARRIS reported broken antenna radial is classified as follows.

a. The incident required maintenance manpower to correct (M).

b. The failure was not considered critical because reception was still possible (X).

c. The failure did not require a supply action for correction (X).

d. The failure is not considered chargeable to AN/SRN-19 unreliability (X).

e. Therefore, the incident is coded MXX-X.

7-2.11 The USS SHIELDS reported 1A4 RAM chip 1101 failure is classified the same as the McDonnell RAM failures for the same reasons.

7-2.12 The USS TOWERS reported printer failure is classified as follows.

a. A maintenance action is required for repair (M).

b. The failure is not considered critical because outputs are available on the display (X).

c. The recovery mode requires a supply action (S).

d. The failure is considered chargeable to the AN/SRN-19 unreliability (CH).

e. Therefore, the failure is coded MXS-CH.

7-2.13 The USS WHIPPLE printer failure is classified the same as the USS TOWERS report for the same reasons.

7-2.14 The three board replacements on the USS VALDEZ were reported as a single maintenance action and therefore counted as a single (multiple part) failure, classified as follows.

a. The failure required a maintenance action (M).

b. The failure by Casrept is considered critical (C).

c. The failure required a supply action for recovery (S).

d. The failure is considered chargeable to AN/SRN-19 unreliability (CH).

e. Therefore, this failure is coded MCS-CH with multiple replacements.

7-2.15 The classification for each reported incident is summarized in Table 7-1. Point estimates are provided for:

MTBF - Mean Time Between Failures (considers the system in a reliability series configuration)
MTBDE - Mean Time Between Downing Events - (considers parallel functional paths as related to the user)
MTBMA - Mean Time Between Observed Maintenance Actions
MTBR - Mean Time Between Parts Replacement

TABLE 7-1
Reliability Data Classification Summary for the AN/SRN-19

	Ship	Failure Classification	What Happened
1.	ADAMS	MXS-CH	SYNC CARD A11
2.		MXS-CH	TT-738 display power supply
3.	USS AINSWORTH	MCS-X	1A4
4.		MCS-X	1A7
5.		MCS-X	1A5
6.		MCS-X	Wiring Change
7.		MCS-X	AN/SRN-19
8.		MCS-X	AN/SRN-19
9.		MCS-X	Display
10.		MCS-X	Printer
11.	USS BEARY	MXX-CH	Printer
12.	USS DOWNES	MXX-CH	Printer
13.	USS GARCIA	MXX-CH	Contacts Cleaned
14.		MXX-CH	Contacts Cleaned
15.	USS GRAY	MCS-CH	1A7
16.		MCS-CH	Processor failed 3PS1 found
17.		MCS-CH	Processor and Failure
18.	USS HEWES	MCX-CH	Display failures intermittent
19.	USS McDONNELL	MCX-CH	Display failures intermittent
20.		MCS-CH	RAM Failure
21.	USS OUELLETT	MCS-CH	RAM Failure
22.	USS PHARRIS	MXX-X	Antenna broken
23.	USS SHIELDS	MCS-CH	RAM Failure
24.	USS TOWERS	MXS-CH	Printer
25.	USS WHIPPLE	MXS-CH	Printer
26.	USS VALDEZ	MCS-CH	1A14, 1A4, 1A15 (One Maintenance Action)

Total Operating Hours - 62,129

	Point Estimate	Lower 90% Confidence Limit	Upper 90% Confidence Limit
Total: 26 Maintenance Actions MTBMA =	2,390	1,835	3,154
17 Critical Failures MTBDE =	3,655	2,633	5,177
*21 Supply Actions MTBR =	2,959	2,203	4,034
**17 Chargeable Failures MTBF =	3,220	2,319	4,562

*The USS VALDEZ MCS-CH multiple part failure counts as three separate supply actions in MTBR point estimate.

**Hours and failures from the USS AINSWORTH were excluded.

Table 7-2 provides point estimates of the frequency for which part replacements were reported during the FRAP reporting period. Those incidents which required a supply action for recovery were utilized as an input for failures. Operating time for point estimates was 62,129 hours.

Table 7-2

Point Estimate Observed Failure Rates
For Parts Replaced

	Qty	Parts Per Million Hours Failure Rate	MTBF
A. Receiver			
1A4	5	81.0	12,269
1A5	1	16.0	61,347
1A7	2	32.0	30,673
1A11	1	16.0	61,347
1A14	1	16.0	61,347
1A15	1	16.0	61,347
3PS1	1	16.0	61,347
Display	1	16.0	61,347
B. Printer	4	65.0	15,337
C. Miscellaneous			
AN/SRN-19	2	32.0	30,673
Wiring	1	16.0	61,347
*D. O-level parts	0	14.7	67,900

*Based on 60% Chi square confidence limit

7-3 Maintainability. There were very few hands on maintenance times reported. Quite often users reported having to utilize extraordinary maintenance procedures to restore equipment operation. O-level personnel in many cases did not have the resources to localize and isolate failures in accordance with the intended design of the equipment. Thus maintenance reports are not considered representative of the equipment maintenance capability.

7-4 Operational Availability. Many of the maintenance actions were repaired by field activities and Mobile Technical Units. A study of CASREP data on all AN/SRN-19 units reveals that the average reported down time was 448 hours. The median was 330 hours. 10% of the actions were completed within 56 hours. 90% of the actions were completed within 1004 hours. A lower limit of Operational Availability based on the mean time between downing events or system functional failure is 0.901. This is based on dividing the mean time between downing events by the sum of the mean time between downing events and CASREP mean down time. NAVELEX is aware of the support problems on the SRN-19 and is taking corrective action.

RELIABILITY DATA

AN/SRN-19

7-5 FLEET RELIABILITY DATA SUMMARY. Table 7-3 (Preliminary Reliability Report for SRN-19) is a summary of the total hours reported, maintenance actions and mean time between maintenance actions (MTBMA) for each reporting platform. Table 7-4 (FRAP Data Summary Sheet) is a listing of all platform FRAP reports for the SRN-19. The column headings LOC, EQ S/N, ETM and TYPE represent a numerical real time sequence of each report (by platform), equipment serial number, elapsed time meter reading (hr) and the type of report respectively. Type of reports are initialization (INIT), failure (FAIL), failure-free-time report (FFTR) and termination (TERM).

TABLE 7-3

PRELIMINARY RELIABILITY REPORT FOR SRN-19

SHIP NAME	HOURS	MAINT ACTIONS	MTBMA
ADAMS (CHARLES F.)	4500	2	2250.00
AINSWORTH	7391	8	923.88
BEARY (DONALD B)	1222	1	1222.00
CONNOLE	2207	0	******
DOWNES	4495	1	4495.00
GARCIA	4414	2	2207.00
GRAY	2314	3	771.33
HART (THOMAS C)	1929	0	******
HEWES (JOSEPH)	5848	1	5848.00
HOEL	2064	0	******
MCDONNELL (EDWARD)	3552	2	1776.00
MILLER	3451	0	******
OUELLET	2509	1	******
PAUL	1776	0	******
PHARRIS	2895	1	2895.00
SHIELDS (MARVIN)	3129	1	3129.00
TOWERS	2679	1	2679.00
VALDEZ	2675	1	2675.00
WHIPPLE	3079	1	3079.00
	62129	26	2389.58

TABLE 7-4
FRAP DATA SUMMARY SHEET (SRN-19

LOC	SHIP NAME	EQ S/N	DATE	ETM	TYPE	
1	ADAMS (CHARLES	C023	80155	0	INIT	
2	ADAMS (CHARLES	C023	81002	4500	FAIL	1A11 SYNC [illegible]
PAIRED(DDG-2/03:DRG 3000 SER 80)						
3	ADAMS (CHARLES	C023	81062	4500	FAIL	PRINTER [illegible]
RT ON ORDER PRNTER INOP.						
4	ADAMS (CHARLES	C023	81117	4500	TERM	
5	TOWERS	C012	80136	965	INIT	
6	TOWERS	C012	80164	1006	FFTR	
7	TOWERS	C012	81114	3644.	FAIL	PRINTER DOWN(MX5-CH0
8	HOEL	C030	80189	3484	INIT	
9	HOEL	C030	81033	5259	FFTR	
10	HOEL	C030	81070	5548	TERM	
11	HEWES (JOSEPH)	C011	80102	0	INIT	
12	HEWES (JOSEPH)	C011	80258	632	FFTR	
13	HEWES (JOSEPH)	C011	81084	5848	FAIL	PRINTER DOWN
14	HEWES (JOSEPH)	C011	81085	5848	TERM	
15	PAUL	C005	80155	0	INIT	
16	PAUL	C005	80274	1603	FFTR	
17	PAUL	C005	80333	1603	FFTR	
18	PAUL	C005	81029	1776	FFTR	
19	BEARY (DONALD B	C025	80210	143	FFTR	
20	BEARY (DONALD B	C025	81040	1175	FFTR	
21	BEARY (DONALD B	C025	81107	1365	FAIL	PRINTER INTERMITTENT
WHEN HOT						
22	BEARY (DONALD B	C025	81108	1365	TERM	
23	AINSWORTH	C009	80102	0	INIT	
24	AINSWORTH	C009	80108	20	FAIL	CABLES CONNECTORS CAU
SING ERRORS,SPEED BEARING						
25	AINSWORTH	C009	80225	2732	FAIL	1A4 REPLACED (REPORTE
D UPON TERMINATION)						
26	AINSWORTH	C009	80225	2732	FAIL	1A7 REPLACED (REPORTE
D UPON TERMINATIOIN)						
27	AINSWORTH	C009	81008	6188	FAIL	POWER SUPPLY REPLACED
28	AINSWORTH	C009	81034	6716	FAIL	1A5 REPLACED (REPORTE
D UPON TERMINATION)						
29	AINSWORTH	C009	81034	6716	FAIL	PRINTER DOWN (REPORTE
D UPON TERMINATION)						
30	AINSWORTH	C009	81064	7340	FAIL	DISPLAY DOWN
31	AINSWORTH	C009	81071	7391	FAIL	SRN-19 REPLACED SEVER
AL TIMES						
32	MILLER	C015	80116	0	INIT	
33	MILLER	C015	80125	1	FFTR	
34	MILLER	C015	80152	1	FFTR	
35	MILLER	C015	80184	588	FFTR	
36	MILLER	C015	80217	854	FFTR	
37	MILLER	C015	80248	865	FFTR	
38	MILLER	C015	80273	1109	FFTR	
39	MILLER	C015	81124	3451	TERM	
40	HART (THOMAS C)	C038	80101	0	INIT	
41	HART (THOMAS C)	C038	80160	495	FFTR	
42	HART (THOMAS C)	C038	80163	709	FFTR	
43	HART (THOMAS C)	C038	80217	1929	FFTR	
44	PHARRIS	C014	80106	0	INIT	

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*   45   PHARRIS          C014  81040  2895   FAIL  ANTENNA DAMAGED BY AC
CIDENT-REPAIRED ON-SHIP
*   46   PHARRIS          C014  81041  2895   TERM
*   47   VALDEZ           C073  80116     0   INIT
*   48   VALDEZ           C073  80260  1400   FAIL  1A4,1A14, AND 1A15 OR
DERED
*   49   VALDEZ           C073  81053  2675   TERM
*   50   GARCIA           C002  80128     0   INIT
*   51   GARCIA           C002  80148   181   FAIL  ERRATIC DISPLAY, CLEA
N CONTACTS
*   52   GARCIA           C002  80182   475   FFTR
*   53   GARCIA           C002  80220  1043   FFTR
*   54   GARCIA           C002  80233  1161   FAIL  ERRATIC DISPLAY, CLEA
N CONTACTS
*   55   GARCIA           C002  81079  4414   TERM
*   56   MCDONNELL (EDWA C026  80105     0   INIT
*   57   MCDONNELL (EDWA C026  81043  3552   FAIL  1A4 RAMS REPORTED REP
LACED
*   58   MCDONNELL (EDWA C026  81043  3552   FAIL  DISPLAY IS INTERMITTE
NT(REQUIRES REINITIALIZATION APPROX WEE
*   59   MCDONNELL (EDWA C026  81044  3552   TERM
*   60   GRAY             C036  80136  6379   INIT
*   61   GRAY             C036  80158  6540   FFTR
*   62   GRAY             C036  80194  6841   FFTR
*   63   GRAY             C036  80214  6918   FFTR
*   64   GRAY             C036  80244  7200   FAIL  1A7
*   65   GRAY             C036  80335  7542   FFTR
*   66   GRAY             C036  81076  8666   FAIL  SYSTEM DOWN, CAUSE NO
T REPORTED
*   67   GRAY             C036  81118 8693.   FAIL  INS. PWR SUPPLY OUTPU
T. REPLACED + 5 V. SUPPLY
*   68   CONNOLE          C007  80161     0   INIT
*   69   CONNOLE          C007  81061  2207   TERM
*   70   WHIPPLE          C010  80227   591   INIT
*   71   WHIPPLE          C010  81098  3670   FAIL  T-837 FAILED IN JUNE
80. ORDED BUT HAVE NOT RECVD REPLACEMEN
*   72   WHIPPLE          C010  81099  3670   TERM
*   73   SHIELDS (MARVIN C033  80130  2555   INIT
*   74   SHIELDS (MARVIN C033  81043  5658   FFTR
*   75   SHIELDS (MARVIN C033  81069  5684   FAIL  RAM1101,1A4,REPLACED
*   76   SHIELDS (MARVIN C033  81070  5684   TERM
*   77   DOWNES           C091  80135   946   INIT
*   78   DOWNES           C091  81117  5441   FAIL  PRINTER INTERMITTENT
WHEN HOT
*   79   OUELLET          C027  80177  1295   INIT
*   80   OUELLET          C027  80209  1715   FFTR
*   81   OUELLET          C027  80244  1790   FFTR
*   82   OUELLET          C027  80256  1813   FAIL  A4 BOARD CHIP #4 FAIL
ED DURING SHIFT FROM SHORE TO SHIPS POW
*   83   OUELLET          C027  80270  1971   FFTR
*   84   OUELLET          C027  80301  2471   FFTR
*   85   OUELLET          C027  80335  3364   FFTR
*   86   OUELLET          C027  80365  3804   FFTR
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APPENDIX A

AN/SRN-19(V)2

RELIABILITY BLOCK DIAGRAM

RELIABILITY BLOCK LISTING

RELIABILITY BLOCK NO.	REF DESIG.	NOMENCLATURE	PART NO.
		Radio Navigation System AN/SRN-19(V)2	7240-0200-69
	1	Receiver-Processor R-2135/SRN-19(V)	7240-000-69
R-046	1A2	Remote Display Driver Board 2	7240-0085
R-033	1A3	RF Decoder Board 3	7240-0052-01
R-041	1A4	RAM-Display Board 4	7240-0053-01
R-034	1A5	TTY & Multiplexer Board 5	7240-0054-01
R-043	1A6	I/O Interface Board 6	7240-0055-01
R-02	1A7	Receiver Assy	7240-1000
R-024	1A7A1	Doppler Recovery and Frequency Synthesizer Assembly	7240-1101-1
R-0241	1A7A1A1	PC Board Assy, Doppler Recovery	7240-1110-01
R-0242	1A7A1A2	PC Board Assy, 30 MHz Buffer	7240-1120-01
R-0243	1A7A1A3	PC Board Assy, 500 KHz Divider	7240-1130-01
R-0244	1A7A1A4	PC Board Assy, Dual 500 KHz Buffer	7240-1140
R-023	1A7A2	Phase Comparator, Loop Filter, and Acquisition Assy	7240-1120
R-0231	1A7A2A1	PC Board Assy, 101.7 Hz Filter	7240-1210
R-0232	1A7A2A2	PC Board Assy, Audio Amplifier	7240-1220
R-0233	1A7A2A3	PC Board Assy, Phase Lock Loop	7240-1230
R-0234	1A7A2A4	Filter Assy, RF Line	7240-1205
R-022	1A7A3	IF Amplifier	7240-1300-01
R-022	1A7A3A1	PC Board Assy, IF Amplifier	7240-1310-01
R-021	1A7A4	400 MHz Front End and Synthesizer Assy	7240-1400-01
R-0211	1A7A4A1	Chassis Assy, 400 MHz Front End	7240-1410

RELIABILITY BLOCK NO.	REF DESIG.	NOMENCLATURE	PART NO.
R-0212	1A7A4A2	PC Board Assy, Frequency Synthesizer	7240-1420-01
R-025	1A7A5	VCXO and LO Multiplier	7240-1500
R-0251	1A7A5A1	PC Board Assy, 12X Multiplier	7240-1510-01
R-0252	1A7A5A2	PC Board Assy, VCXO and LO Multiplier	7240-1520-01
R-026	1A7A6	Power Filter Assy	7240-1600-01
R-035	1A9	Oscillator Assy	7240-0013-01
R-035	1A9A1	3-Way Power Splitter	7240-0033
R-044	1A11	Circuit Board Assy, Synchro-to-Digital	7240-0070
R-042, R-061	1A12/3A1	PC Board Assy, Display Board	7240-0080-09
R-031	1A14	Microprocessor Board 7	7240-0084-01
R-032	1A15	ROM MK IV Board 1	7240-0138
R-06	3	Readout Indicator ID-2182/SRN-19(V)	7240-0110
R-062	3A2	Signal Receiver	7240-0118-01
R-012	4	RF Amplifier AM-7010/SRN-19(V)	7240-0043
R-05		Power Supply	RMT-001-AA-20958
R-045	1A17	Keyboard	105-77-03007-01

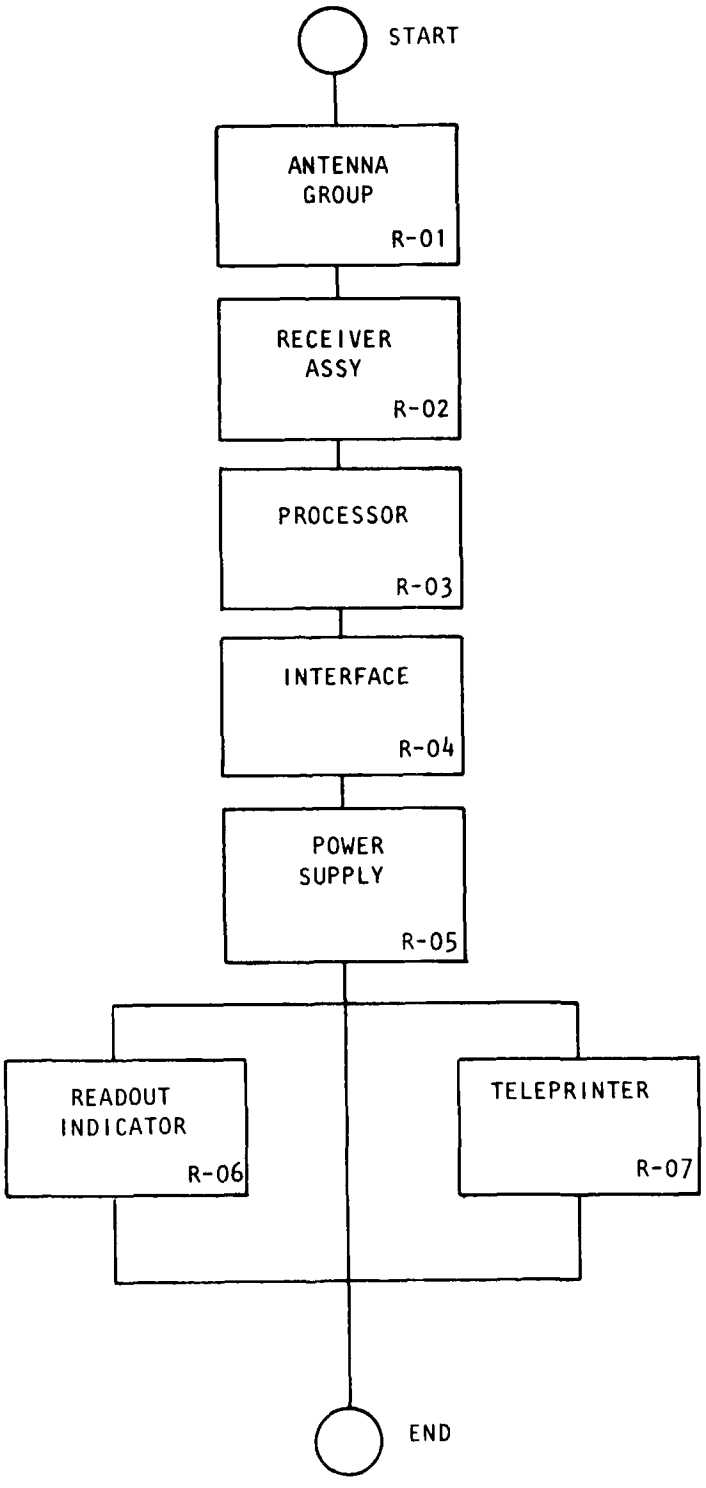

FIGURE 1.
AN/SRN-19(V)2
OVERALL BLOCK DIAGRAM
RELIABILITY MODEL

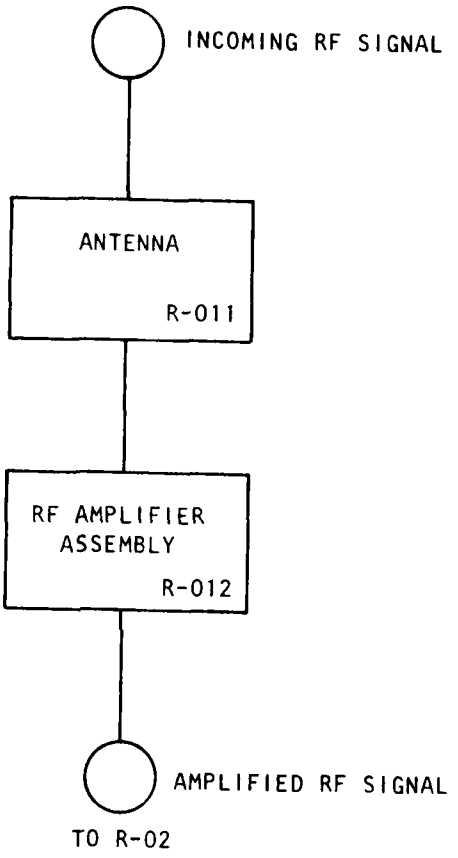

FIGURE 2.
BLOCK R-01 UNITS
ANTENNA GROUP

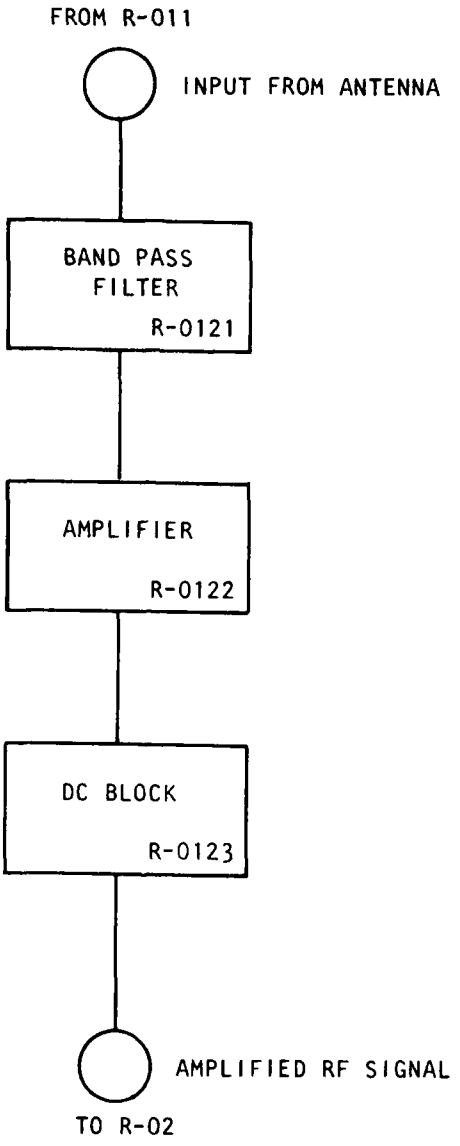

FIGURE 2.1
UNIT R-012 ELEMENTS
RF AMPLIFIER

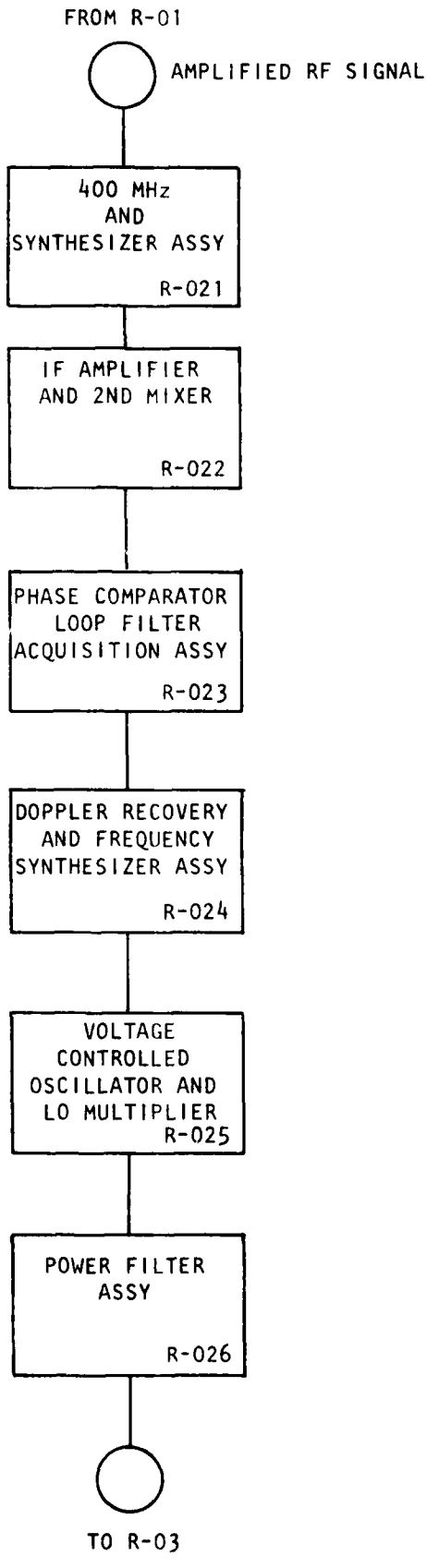

FIGURE 3.
BLOCK R-02 UNITS
RECEIVER ASSEMBLY

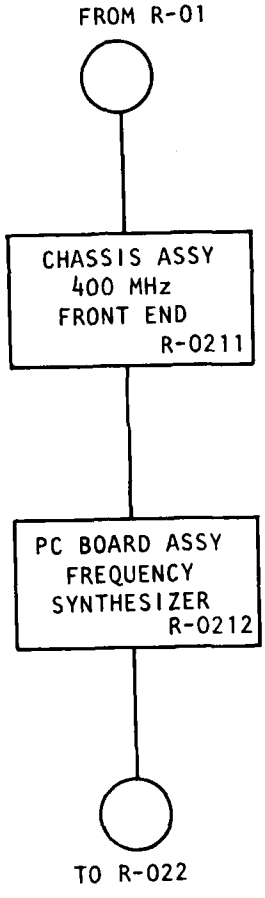

FIGURE 3.1
UNIT R-021 ELEMENTS

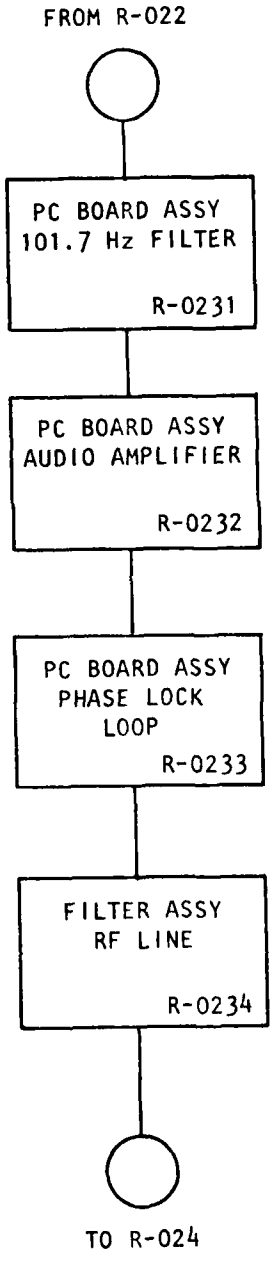

FIGURE 3.2
UNIT R-023 ELEMENTS

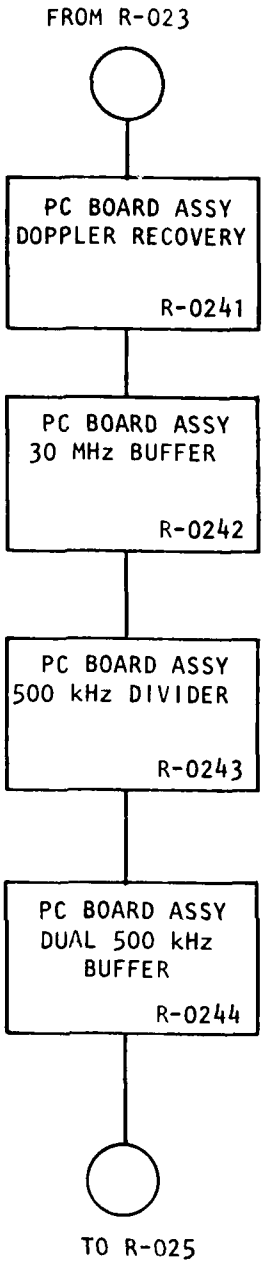

FIGURE 3.3
UNIT R-024 ELEMENTS

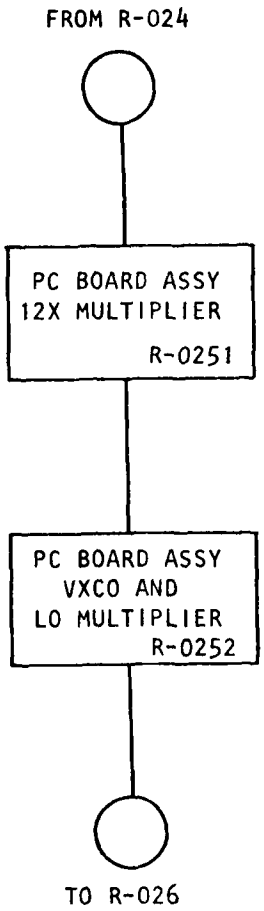

FIGURE 3.4
UNIT R-025 ELEMENTS

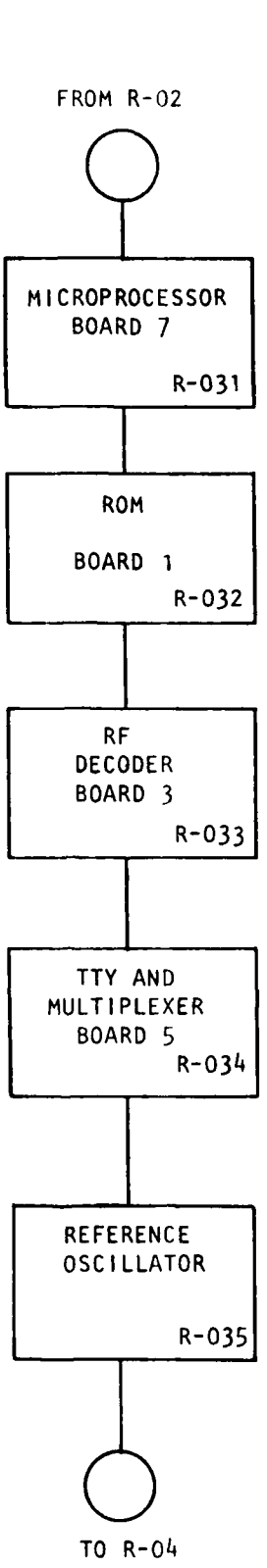

FIGURE 4.
BLOCK R-03 UNITS
PROCESSOR

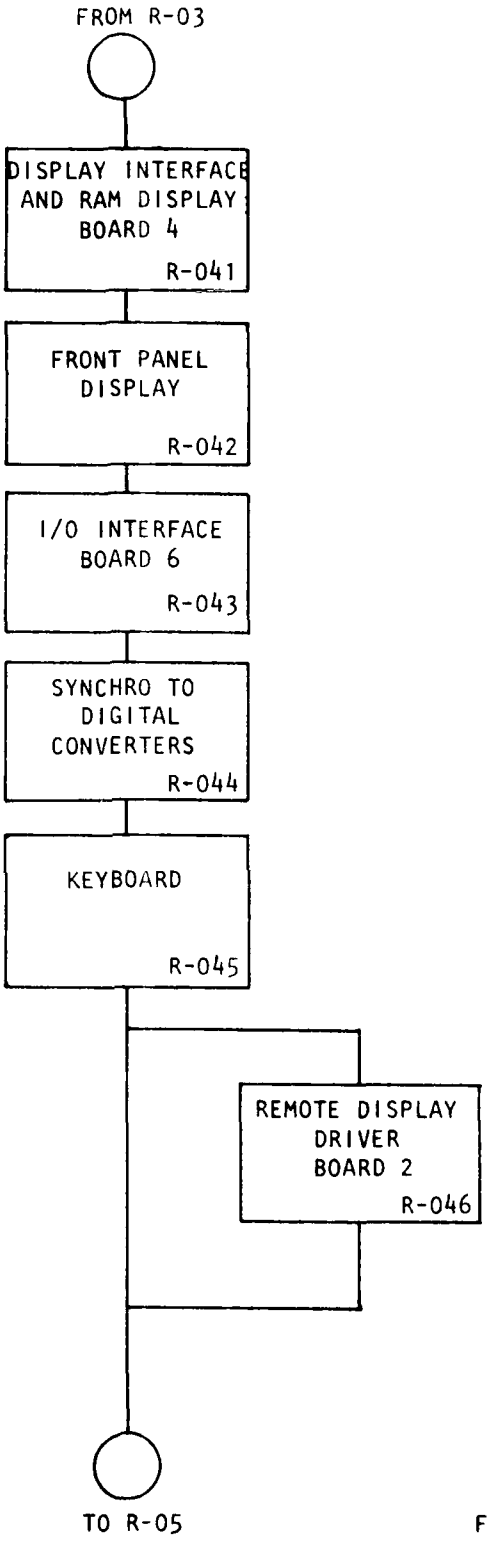

FIGURE 5.
BLOCK R-04 UNITS

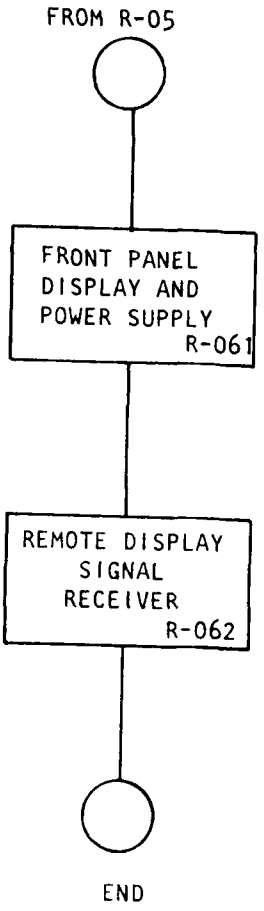

FIGURE 6.
BLOCK R-06 UNITS

APPENDIX B

Mark VII Program

Test and Evaluation by

NESEA

DEPARTMENT OF THE NAVY

NAVAL ELECTRONIC SYSTEMS ENGINEERING ACTIVITY

Saint Inigoes, Maryland 20684

81 MAR 2 A10:48

IN REPLY REFER TO
Code 0242:JPD
10550/81-39-24
Ser 42028
FEB 23 1981

From: Commanding Officer, Naval Electronic Systems Engineering Activity, St. Inigoes
To: Commander, Naval Electronic Systems Command (Code 52013C)

Subj: Final Report on NESEA Project 81-39-24 titled, "AN/SRN-19 Mark VII Program Test and Evaluation"; forwarding of

Ref: (a) NAVELEX ltr 52013C:TFK:fc 9420 Ser 396-5201 of 6 Oct 1980

1. The Commander, NAVELEX, by reference (a), requested NESEA to perform at-sea trials of the AN/SRN-19 satellite navigation receiver's Mark VII program under project 81-39-24. The sea trials were performed on the USS VOGE (FF-1047) and the USS TRIPPE (FF-1075) from 8 to 13 December 1980 and 10 to 15 December 1980, respectively.

2. The Mark VII program is installed in the AN/SRN-19 by replacing circuit boards 1B and 4 with 1D and 4A, respectively. The software is stored in programable-read-only-memory on board 1D versus the read-only-memory of board 1B. Board 4A has new random-access-memory integrated circuits (part number 21021PC). The differences between the Mark VII and the Mark IV programs are the following:

a. The satellite elevation angle above the horizon at its closest approach to the receiver is now computed rather than taken at the nearest two-minute mark.

b. Time-ordered satellite alerts with a capability of storing up to seven sets of satellite orbit data are now available.

c. Satellite orbit data can be entered manually through the keyboard in entry codes 91 through 97.

d. Entry codes 25 (Julian day), 26 (year), and 22 (satellite alert request) have been added to compute and print satellite alerts.

e. Display code 19 has been added to display the satellite orbit data and satellite alert data on the LED display.

f. Display code 16 has been added to display the next satellite alert.

g. The next satellite alert is automatically computed after each satellite pass.

h. Statistical summary displays and display codes 17 (average latitude and longitude) and 18 (sigma latitude and total RMS) that obtain up to 100 automatically updated passes from a stationary position have been added to give fix accuracy data.

i. Data entry 27 has been added to reset the statistics gathering routine.

j. Entry code 12 has been changed so that ship's speed and heading inputs can be made in any combination of automatic or manual modes.

k. When manual speed inputs are selected the speed is now preset to zero knots.

l. Any display code may now be printed or recorded during automatic print and record cycles by using entry codes 15, 16, and 17.

m. The velocity change activated recordings have been changed from a 0.28-knot change to activate the recording to a 12.5% change in speed to activate the recording.

n. The data entry procedure has been changed such that the present value of data appears in display windows 2 and 3, thus preventing data from being destroyed by double depression of the entry key.

o. The maximum acceptable elevation for an automatically updated satellite pass has been changed from 80 degrees to 70 degrees.

p. The antenna height now appears in display code 8.

q. The velocity recording after each satellite pass has been deleted.

r. The round-off problem in which one-hundreth of a minute was subtracted from each latitude and longitude entry has been corrected.

3. The following results were obtained:

a. On board the USS VOGE, the USS TRIPPE, and at NESEA all of the above functions were exercised successfully with no hardware or software problems encountered.

Code 0242:JPD
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Ser 42028
FEB 2 9 1981

b. Satellite alert times generally agreed with the actual time of the pass within plus or minus two minutes with a worst case of plus four minutes.

c. Alert elevation angles were within one degree of the actual pass elevation angle as long as the position from which the alerts were requested was within 60 nm of the satellite fix position. As distance between these positions increased the deviation between pass elevation angle and alert elevation angle increased. (Example: At a distance of 400 nm the elevation angle deviation increased to as much as nine degrees. This deviation is perfectly acceptable and accountable, but a note explaining the alert data accuracies should be included in the operator's manual.

d. There was an operator/software problem on the USS TRIPPE in which satellite alert data was requested by the operator while a satellite pass was in progress, resulting in erratic printer performance. In general, no entry codes should be used while a satellite pass is in progress, since it confuses the computer with partially old information and partially new information needed to compute the satellite fix. A statement to this effect should be included in the operator's manual.

4. The Mark VII program for the AN/SRN-19 has performed as specified and should be considered for service use. The Mark VII program will replace all Mark IV and Mark V programs used in the fleet with the exception of the Mark V programs used in SURTASS ships. All Mark V programs removed from non-SURTASS ships should be sent to NESEA to be held for SURTASS ships.

5. Unless otherwise directed, this project is considered terminated with the distribution of this report.

for A. G. KIRBY

APPENDIX C

NAVELEX San Diego

System Status and Progress Reports

1 May 1980

AN/SRN-12(V)2 SYSTEM STATUS

Date 1 May 1980

	Serial Nr	Date Received	Status *Code*	Shipped To	Shipping Date	Installed	Instln Date	Cert Comp Date	Remarks
	C001	4/30/79	A	NSY Charleston	5/11/79	USS PATTERSON	Unknown	None	System not Cert.
	C002	Unknown	C	AMEX Charleston	6/12/79	USS GARCIA	6/12/79	6/29/79	
	C003	1/29/80	C	NSY Pearl Harbor	Unknown	USS RATHBURNE	3/10/80	3/27/80	
**	C004	6/6/79	E	AMEX Charleston	7/21/79	USS BRUMBY	12/10/79	1/7/80	
	C005	6/18/79	A	NSY Charleston	6/28/79	USS PAUL	Unknown	None	System not Cert.
**	C006	1/80	E	JHU, APL MARYLAND	1/80	JHU, APL MARYLAND			Failure Eval. on System
	C007	Unknown	C	AMEX Charleston	8/14/79	USS CANOLE	9/3/79	9/20/79	
	C008	Unknown	None	NYS Pearl Harbor	Unknown	USS HOLT			System not Cert.
	C009	6/6/79	E	USS AINSWORTH	12/4/79	----	----	----	Back-up
	C010	Unknown	None	NSY Pearl Harbor	Unknown	USS WHIPPLE	10/8/79	10/19/79	
	C011	6/6/79	A	AMEX Charleston	8/28/79	USS HEWES	10/23/79	11/9/79	
	C012	Unknown	None	NSY Long Beach	Unknown	USS TOWERS			
	C013	Unknown	None	COMPHIBGRU TWO Norfolk, VA	2/5/80	USS SIAPAN			Temp. installed on SIAPAN
	C014	7/27/79	A	AMEX Charleston	8/14/79	USS PHARRIS	8/27/79	9/6/79	
	C015	7/27/79	A	AMEX Charleston	9/10/79	USS MILLER	9/18/79	9/25/79	
	C016	Unknown	None	SRF Yokosuka	Unknwon	FFT USS KIRK	Unknown	None	Not Scheduled for Cert.
	C017	Unknown	None	FTC School Norfolk, VA	Received	FTC School	Complete	----	None
	C018	Unknwon	None	Service School Comm. NTC SD	Unknown	Serv. School	Unknown	----	None

*Status Code

A-Received, not checked out B-Checkout in progress C-Required corrective maintenance
D-Checkout complete, ready for shipment E-Failed hardware problems

** - Indicates status change from previous report

AN/SRN-19(V)2 SYSTEM STATUS

Date 1 May 1980

Serial Nr	Date Received	Status *Code*	Shipped To	Shipping Date	Installed	Instln Date	Cert Comp Date	Remarks
C019	7/10/79	A	AMEX Charleston	7/12/79	USS AYLWIN	7/16/79	7/26/79	
C020	Unknwon	None	NSY Bath, ME	Unknown	USS SIMS	Unknown	None	Not Scheduled for Cert.
C021	7/10/79	B&C	NESEC San Diego	----	FMA NESEC SD	8/21/79	Not Req.	
C022	7/10/79	C&D	AMEX San Diego	10/12/79	USS BADGER	10/15/79	11/15/79	
C023	Unknwon	None	NSY Phila.	Unknown	USS CHARLES F. ADAMS	Unknown	None	Not Scheduled for Cert.
C024	8/31/79	C	AMEX Charleston	9/28/79	USS PERRY	10/15/79	10/24/79	
C025	8/9/79	C	NSY Portsmouth	10/28/79	USS BEARY	Unknown	None	Not Scheduled for Cert.
C026	8/9/79	A	AMEX Charleston	9/10/79	USS MC DONNEL	10/2/79	10/12/79	
C027	8/9/79	B	AMEX San Diego	10/12/79	USS OUELLET	10/29/79	11/14/79	
C028	Unknown	None	1st Naval Dist. Boston	Unknown	USS BLAKELEY	Unknown	None	Not Scheduled for Cert
C029	Unknown	None	3rd Naval Dist. Brookly, NY	Unknown	Bldg. 4, Rm. 20075, FF1097	Unknown	None	Not Scheduled for Cert.
C030	Unknown	None	NSY Long Beach	Unknown	USS HOEL	Unknown	None	Not Scheduled for Cert.
C031	Unknown	None	NSY Phila.	Unknown	USS CONYNGHAM	Unknown	None	Not Scheduled for Cert.
C032	9/17/79	A	Back-up USS AINSWORTH	9/29/79	----	----	----	Receiver-Processor only
C033	8/9/79		AMEX San Diego	8/13/79	USS SHIELDS	8/14/79	10/15/79	
C034	Unknown	None	NSY Bremerton	Unknown	USS WADDELL	Unknown	None	Not Scheduled for Cert.
C035	Unknown	None	NSY Bremerton	Unknown	USS LOCKWOOD	Unknown	None	Not Scheduled for Cert.
** C036	9/10/79	D	AMEX San Diego	9/28/79	USS GRAY	12/17/79	2/9/80	

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AN/SRN-19(V)2 SYSTEM STATUS

Date 1 May 1980

	Serial Nr	Date Received	Status *Code*	Shipped To	Shipping Date	Installed	Instln Date	Cert Comp Date	Remarks
	C037	9/17/79	A	NESEC San Diego	12/2/79	----	----	----	SSIP Program
	C038	9/17/79	D	AMEX Charleston	11/13/79	USS HART	11/27/79	12/6/79	
	C039								Reliability Test AMEX
	C040								"
	C041	9/17/79	Holding	USS HAMMOND	11/19/79	USS HAMMOND	1/2/80	2/28/80	
	C042								Reliability Test AMEX
	C043	9/17/79	Holding	Stowed NESEC San Diego					System Inop.
	C044	9/17/79	E	MOTU SIX	4/30/80				MAM Kit
**	C045	Unknown	None	FFT BROOKE NYS Long Beach			Unknown		Not Scheduled for Cert.
**	C046	Unknown	None	Newport, RI M/F Pat Garrett			Unknown		Not Scheduled for Cert.
**	C047	Unknown	E	NSY Mare Island FFT PIGEON	Being returned to NAVELEXSYSENGCEN San Diego, Hardwire problems				
**	C048	Unknown	E	NSY Seattle FFT ROARK			Unknown		Not Scheduled for Cert.
**	C049	Unknown	E	NSY Long Beach FFT BUCHANAN			Unknown		"
**	C050	Unknown	E	NSY Hunters Point FFT MOUNT HOOD			Unknown		"
**	C051	11/19/79		MOTU THIRTEEN	4/22/80				MAM Kit
**	C052	Unknown	None	NSY Hunters Point FFT KANSAS CITY			Unknown		Not Scheduled for Cert.
**	C053	Unknown	None	NSY Pearl Harbor FFT BREWTON			Unknown		"
**	C054	11/19/79		MOTU SEVEN	4/22/80				MAM Kit

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AN/SRN-19(V)2 SYSTEM STATUS

Date 1 May 1980

	Serial Nr	Date Received	Status *Code*	Shipped To	Shipping Date	Installed	Instln Date	Cert Comp Date	Remarks
**	C055	Unknown	None	MOTU THIRTEEN	4/22/80				MAM Kit
**	C056	Unknown	E	SUPSHIP Mayport FFT MONTGOMERY	Being returned to NAVELEXSYSENGCEN San Diego.				Harwire problem.
**	C057	11/19/79	D	MOTU ONE Pearl Harbor	1/18/80	USS PEARY	1/27/80		Replaces S/N C003 Inop.
**	C058	11/19/79	D	AMEX Charleston	12/27/79	R. E. BYRD	1/4/80	1/15/80	
**	C059	11/19/79	D	Temp. Instln. USS BARBEY	1/10/80	USS BARBEY	1/10/80		Rcvr Processor Antenna/Preamp ~~Teleprinter only~~
**	C060	11/19/79	D	AMEX San Diego	2/4/80	USS MEYERKORD	2/8/80	2/25/80	
**	C061	11/19/79	D	AMEX Charleston	2/4/80	USS TALBOT	2/11/80	2/29/80	
**	C062	11/19/79	D	AMEX Charleston	12/27/79	USS SELLERS	1/14/80	2/6/80	
**	C063	Unknown	None	NSC San Diego 2Z Assets	Dec 1979	Unknown			Shipped Estination Unknown
**	C064	Unknown	B	JHU/APL Maryland		Testing			
**	C065	Unknown	B	JHU/APL Maryland		Testing			
**	C066	Unknown	None	NSC San Diego 2Z Assets	Dec 1979	Unknown			Shipped Destination Unknown
**	C067	1/23/80	B	NSY Charleston	2/22/80	USS ORTOLAN			
**	C068	Unknown	None	NSC San Diego 2Z Assets	Dec 1979	Uninown			Shipped Destination Unknown
**	C069	Unknown	B	JHU/APL Maryland		Testing			
**	C070	Unknwon	None	NSC San Diego 2Z Assets	Dec 1979	Unknown			Shipped Destination Unknown
**	C071	1/23/80	D	PHILBGRU TWO Norfolk	2/5/80	USS NASSAU			To be Temp. installed on NASSAU
**	C072	Unknown	None	NSC San Diego 2Z Assets	Dec 1979	Unknown			Shipped Destination Unknown

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AN/SRN-19(V)2 SYSTEM STATUS

Date 1 May 1980

	Serial Nr	Date Received	Status *Code*	Shipped To	Shipping Date	Installed	Instln Date	Cert Comp Date	Remarks
**	C073	1/23/80	D	AMEX Charleston	2/4/80	USS VALDEZ	2/13/80	3/14/80	
**	C074	2/8/80	D	SUPSHIP San Fran.	3/19/80	USS SAN JOSE			Not scheduled for Cert.
**	C075	2/8/80	D	AMEX San Diego	2/22/80	USS LANG	2/25/80	4/10/80	
	C076	2/20/80	D	AMEX Charleston	2/5/80	USS TRUETT	3/14/80	4/23/80	
	C077	3/4/80	D	AMEX Charleston	2/29/80	USS SUNBIRD	3/31/80	Pending	
	C078	2/20/80	D	AMEX San Diego	3/7/80	USS BERKLEY	3/10/80	Pending	
	C079	2/15/80	D	SUPSHIP Jacksonville	2/25/80	USS MONTGOMERY	----	----	Not Scheduled for Cert.
	C080	3/5/80	D	SUPSHIP San Diego	3/19/80	USS HEPBURN	----	----	"
	C081	3/4/80	D	NESEC San Diego	3/10/80	USS BAGLEY	3/10/80	----	Replaced S/N C054
	C082	3/4/80	D	AMEX San Diego	3/21/80	USS RAMSEY	3/26/80	4/11/80	
	C083	3/5/80	D	Newport RI	3/21/80	Pat Garrett	----	----	Not Scheduled for Cert.
	C084	3/12/80	D	AMEX San Diego	3/25/80	USS GOLDSBOUGH	3/31/80	Pending	
	C085	3/4/80	D	SUPSHIP Mare Island	3/25/80	USS PIGEON	----	----	Replaced S/N C047
	C086	3/12/80	D	AMEX Charleston	4/3/80	USS VOGE	4/14/80	Pending	
	C087	3/12/80	D	AMEX Charleston	4/3/80	USS PETREL	4/28/80	Pending	
	C088	3/27/80	D	AMEX San Diego	4/4/80	USS JOS. STRAUSS	3/21/80	Pending	
	C089	3/27/80	D	USS PELELIU	4/7/80	USS PELELIU	4/16/80	----	Temp. Instln.

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AN/SRN-19(V)2 SYSTEM STATUS

Date 1 May 1980

Serial Nr	Date Received	Status *Code*	Shipped To	Shipping Date	Installed	Instln Date	Cert Comp Date	Remarks
C090	3/27/80	D	SRF Yokosuka	4/24/80	White Plains			
C091	3/31/80	D	USS DOWNES	4/24/80	DOWNES			Replaces S/N C055
C092	4/17/80	D	AMEX Charleston	5/1/80	FFT GLOVER			
C093	4/17/80	D	AMEX Charleston	5/1/80	FFT KITTIWAKE			
C094	4/17/80	D	AMEX San Diego	5/1/80	FFT H. B. WILSON			
C095	4/17/80	B	NESEC SD					
C096	4/17/80	B	"					
C097	4/17/80	~~D~~ B	"					
C098	5/8/80	B						
C099	5/8/80	B						
C100	5/8/80	B						
C101	5/8/80	B						
C102	5/8/80	B						

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AN/SRN-19(V)2 SYSTEM

PROGRESS REPORT NR 6

80 MAY 16 A7:30

1 May 1980

1. During the period 15 February through 31 March 1980, Tiger Teams installed/certified systems on the following ships.

Ship	Hull Nr.	System S/N	Certification Date
USS FRANCIS HAMMOND	FF-1067	C041	28 Feb 80
USS MEYERKORD	FF-1058	C060	25 Feb 80
USS R. E. BYRD	DDG-23	C058	04 Feb 80
USS BREWTON	FF-1086	C053	25 Feb 80
USS TALBOT	FFG-4	C061	29 Feb 80
USS VALDEZ	FF-1096	C073	14 Mar 80
USS TRUETT	FF-1095	C076	23 Apr 80
USS LANG	FF-1060	C075	10 Apr 80
USS BERKELEY	DDG-15	C078	Pending
USS RAMSEY	FFG-2	C082	11 Apr 80
USS SUNBIRD	ASR-15	C077	Pending
USS VOGE	FF-1047	V086	Pending
USS JOSEPH STRAUSS	DDG-16	C088	Pending
USS GOLDSBOROUGH	DDG-20	C084	Pending

2. The following ships have been scheduled to receive AN/SRN-19 systems.

Ship	Hull Nr.	Location	Date
USS PETREL	ASR-14	Charleston SC	05-16 May
USS KITTIWAKE	ASR-13	Norfolk VA	17-27 May
USS H. B. WILSON	DD-67	San Diego CA	05-16 May
USS FLORIKAN	ASR-9	San Diego CA	19-30 May
USS SAIPAN	LHA-2	Norfolk VA	02-13 Jun

2. Continued

Ship	Hull Nr.	Location	Date
USS SEMMES	DDG-18	Charleston SC	Jul/Aug
USS BARNEY	DDG-6	Norfolk VA	Aug
USS R. L. PAGE	FFG-5	Norfolk VA	Sep
USS KOELSCH	FF-1049	Mayport FL	Oct
USS C. V. RICKETTS	DDG-5	Norfolk VA	Dec

3. The following ships are to receive AN/SRN-19 systems but scheduled availabilities have not been established.

Ship	Hull Nr.	Location
USS COCHRANE	DDG-21	Pearl Harbor HI
USS BRADLEY	FF-1041	Long Beach CA
USS DAVIDSON	FF-1045	Pearl Harbor HI
USS REASONER	FF-1063	San Diego CA
USS COOK	FF-1083	San Diego CA
USS TARAWA	LHA-1	San Diego CA
USS BELLEAU WOOD	LHA-3	San Diego CA
USS GLOVER	FF-1098	Deferred until after shipyard overhaul

4. By direction from COMNAVELEXSYSCOM Washington, D.C., four systems were transferred from 22 assets for the following reasons.

a. S/N C079 sent to SUPSHIP Jacksonville FL FFT to USS E. MONTGOMERY; replacement for S/N C056 hard wire problem being returned to NAVELEX, San Diego.

b. S/N C085 sent to SUPSHIP Mare Island CA FFT to USS PIGEON; replacement for S/N C047 hard wire problem being returned to NAVELEX, San Diego.

c. S/N C081 sent to MOTU 1, Pearl Harbor HI FFT to USS BAGLEY; replacement for S/N C054 hard wire problem, returned to NAVELEX, San Diego.

d. S/N C089 sent to USS PELELIU (LHA-5) for temporary installation.

5. The following Maintenance Assist Modules (MAM) kits have been distributed to MOTUs as directed by COMNAVELEXSYSCOM ltr Ser 155-5201 of 28 March 1980.

From System S/N	Location	Qty	Date
C051 & C055	MOTU 13	2	22 Apr 80
C054	MOTU 7	1	22 Apr 80
C044	MOTU 6	1	30 Apr 80

6. Reliability summary of systems from 15 February through 1 May 1980.

a. During the period 15 February through 31 March 1980, there were 23 casualties which NAVELEX, San Diego, NESEA, St. Inigoes and MOTUs have repaired. Four systems have hard wire problems and will be used as MAM kits.

f. From 1 April through 1 May 1980, there have been only five casualties.

Detailed information is listed on system failure report.

AN/SRN-19 SYSTEM FAILURE REPORT

Date: 1 May 1980

SYSTEM S/N	INSTALLED/LOCATION	FAILURE/DATE	ACTION TAKEN/DATE
C054	USS BAGLEY	BD #4 (Z12)/2-14-80	NAVELEX SD replaced chip/2-14-80
C019	USS AYLWIN	P.S. #4 (+5V)/2-20-80	MOTU 10 replaced chip/2-26-80
C001	USS PATTERSON	Cassette Recorder BD #6/2-21-80	MOTU 12 replaced recorder BD#6/3-3-80
C007	USS CONNOLE	P.S. #1 (+5V)/2-18-80	MOTU 6 replaced P.W. #1/3-6-80
C026	USS E. MCDONNELL	BD #4 (Z12)/2-17-80	MOTU 12 replaced chip/2-18-80
C058	USS R. E. BYRD	BD #7/2-20-80	MOTU 10 replaced BD #7/2-20-80
C016	URR KIRK	P.S. #1 (+5V)/2-19-80	MOTU 7 replaced P.S. #1/2-28-80
C054	USS BAGLEY	BD #1/2-19-80	MOTU 1 replaced BD #1/2-20-80
C033	USS MARVIN SHIELDS	BD #7, BD 34 (Z6)/2-21-80	NAVELEX SD replaced BD#7, chip/2-22-80
C056	USS E. MONTGOMERY	Hard Wire Problems/3-3-80	Being returned to NAVELEX, San Diego
C079	USS E. MONTGOMERY	5 MHz Osc, P.S. #3 (+12V) BD #6/3-18-80	MOTU 12 replaced defected parts/3-24-80
C051	USS DOWNES	P.S. #1 (+5V), BD #1, BD #4 (Z6)/3-4-80	NAVELEX SD replaced defected parts/3-6-8
C033	USS MARVIN SHIELDS	BD 37/3-17-80	MOTU 1 replaced BD #7/3-28-80
C054	USS BAGLEY	BD #7 (2)/3-17-80	MOTU 1 replaced unit w/S/N C081/3-21-80
C057	USS R. E. PEARY	BD #4 (Z12)/3-3-80	MOTU 1 replaced chip/3-4-80
C076	AMEX CHARLESTON T.B.D.	P.S. #3 (+12V)/3-18-80	AMEX Chasn replaced P.S. #3/3-21-80
C012	USS TOWERS	BD #4 (Z6)/3-17-80	NAVELEX SD replaced chip/3-18-80
C05[illegible]	USS DOWNES	Hard Wire Problems/3-10-80	Returned to NAVELEX San Diego 3-11-80, Replaced with S/N C055/3-12-80

AN/SRN-19 SYSTEM FAILURE REPORT

Date: _____

SYSTEM S/N	INSTALLED/LOCATION	FAILURE/DATE	ACTION TAKEN/DATE
C075	USS LANG	5MHz Osc/3-26-80	NAVELEX SD replaced 5MHz Osc/3-28-80
C055	USS DOWNES	P.S. #3 (+12V), BD #7/4-8-80	NAVELEX SD removed system (hard wire problem), Replaced w/S/N C091/4-24-80
C074	NAVELEX, San Diego, T.B.D.	Stickey Keyboard "Key" 8/2-28-80	NAVELEX SD replaced keyboard/2-28-80
C090	NAVELEX, San Diego, T.B.D.	P.S. #4 (+5V)/4-17-80	NAVELEX SD replaced P.S. #4/4-17-80
C093	NAVELEX, San Diego, T.B.D.	P.S. #4 (+5V)/4-22-80	NAVELEX SD resoldered P.S. #4/4-22-80
C096	NAVELEX, San Diego, T.B.D.	Msg Sync Light (Diode), Leads soldered in reverse	NAVELEX SD resoldered in leads correctly/4-23-80
C047	SUPSHIP Mare Island, M/F USS PIGEON	Hard wire problems/3-18-80	Being returned to NAVELEX, San Diego Replaced system w/S/N C085/3-25-80
C088	USS JOSEPH STRAUSS	P.S. #4 (+5V)/4-23-80	MOTU 1 replaced P.S. #4/4-25-80

FAILURE ITEM REPAIR STATUS

1 May 1980

	DESCRIPTION	SERIAL NR	FROM SYSTEM SER NR	REPAIR ACTION			DISPOSITION	CYCLE COMPL
				DATE INITIATED		COMPL DATE		
**	PS #2	7634-1034		1/7/80	Returned to AMEX Hawthorne	3/5/80	NESEC SD R.F.I.	100%
	PS #2	7632-1037		1/7/80	"		Rework	
	PS #3	None		1/7/80	"		Rework	
**	PS #4	None		1/7/80	"	3/5/80	NESEC SD R.F.I.	100%
**	PRINTER	C044	C044	1/7/80	"	3/5/80	"	100%
**	RECEIVER TRAY	085	C013	1/7/80	"	3/5/80	Installed S/N C033	100%
**	BD #5 119		C062	1/7/80	"	2/14/80	NESEC SD R.F.I.	100%
**	RECEIVER TRAY	094	C033	2/11/80	"		Rework	
**	PRINTER	C037	C037	2/11/80	"	3/5/80	SSIP Program, SD	100%
**	PRINTER	C006	C036	2/11/80	"	1/29/80		100%
	BD #4	H106		2/11/80	"		Rework	
	BD #6	121		2/11/80	"		Rework	
	PS #3	None	C003	2/11/80	"		Rework	
	PS +5V	8974	C010	2/11/80	"		Rework	
	PS -12V	1084	C003	2/11/80	"		Rework	
	PS #3	None		2/11/80	"		Rework	
**	BD #1	SP2[illegible]		2/23/80	"			
**	BD #5	SP[illegible]7		2/23/80	"		Rework	
**	BD #6	07[illegible]		2/23/80	"		Rework	
**	PS #4	831		2/23/80	"		Rework	

** Testbench system change from previous system

FAILURE ITEM REPAIR STATUS

1 May 1980

	DESCRIPTION	SERIAL NR	FROM SYSTEM SER NR	REPAIR ACTION			DISPOSITION	CYCLE COMPL
				DATE INITIATED		COMPL DATE		
**	PS #4	845		3/23/80	Returned to AMEX Hawthorne		Rework	

** Indicates status change from previous report

Event No.	Reported Down Time	Cumulative Time	Cumulative Time Total Time
1	1	1	.00005
2	12	13	.00062
3	22	35	.00166
4	25	60	.00285
5	56	116	.00550
6	72	188	.00892
7	72	260	.01233
8	94	354	.01679
9	104	458	.02173
10	112	570	.02704
11	123	693	.03287
12	141	834	.03956
13	141	975	.04625
14	143	1118	.05303
15	146	1264	.05996
16	147	1411	.06693
17	148	1559	.07395
18	213	1772	.08406
19	257	2029	.09625
20	262	2291	.10868
21	271	2562	.12153
22	280	2842	.13481
23	288	3130	.14847
24	335	3465	.16437
25	360	3825	.18144
26	377	4202	.19933
27	383	4585	.21749
28	399	4984	.23642
29	405	5389	.25563
30	452	5841	.27707
31	454	6295	.29861
32	485	6780	.32162
33	597	7377	.34994
34	640	8017	.38030
35	642	8659	.41075
36	647	9306	.44144
37	657	9963	.47261
38	675	10638	.50463
39	724	11362	.53897
40	797	12159	.57678
41	817	12976	.61553
42	890	13866	.65775
43	992	14858	.70481
44	1004	15862	.75243
45	1098	16960	.80452
46	1349	18309	.86851
47	2772	21081	1.00000

Total Down Time = 21,081 hours
Average Down Time = 448 hours
50% or Median = 330 hours
Observed Lower 10% Point = 56 hours
Observed Upper 10% Point = 1,004 hours

END

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